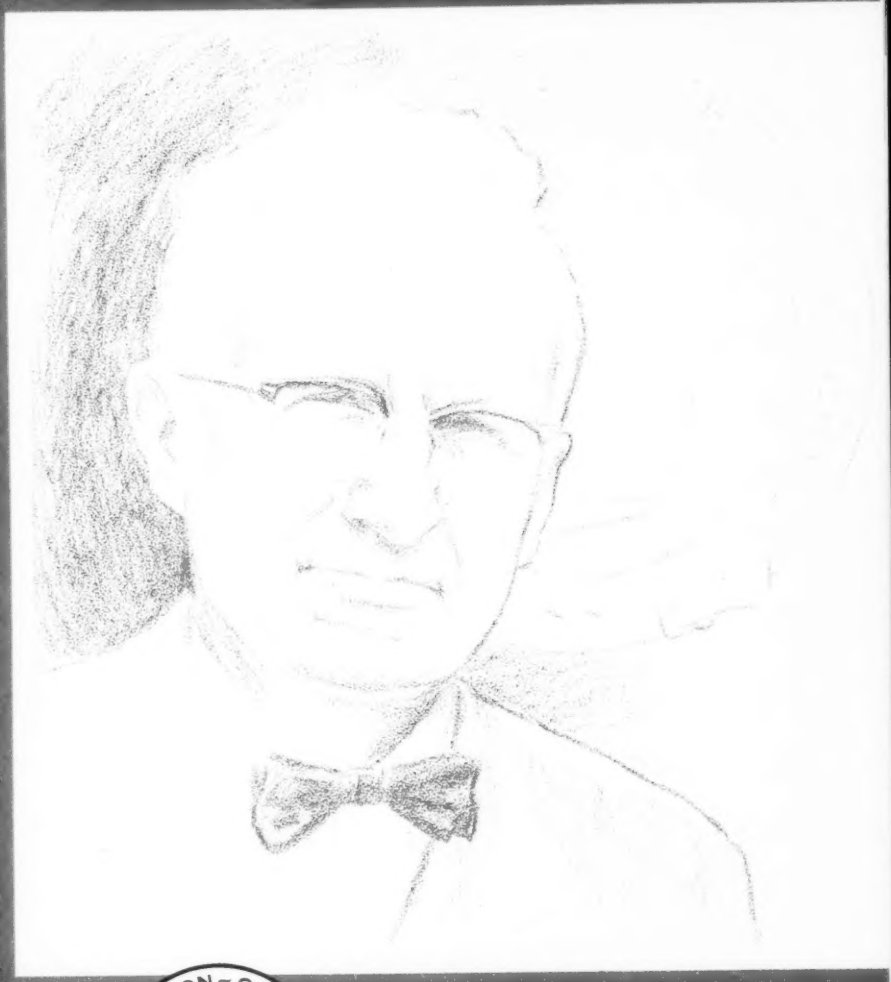
# GeoTimes

Professional News Magazine



**Jan.-Feb. 1960**

Vol. IV, No. 5
Published by the
American Geological Institute

# Calendar

*Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.*

Jan. 11-13, 1960—FIRST INTERNAT. SYMPOSIUM on Arctic Geology, sponsored by Alberta Soc. of Petrol. Geologists; Calgary, Alta., Canada.

Feb. 4-5, 1960—AGU: Pacific SW Regional Meeting, Los Angeles, Calif. Write: Vito A. Vanoni, Caltech, 1201 E. California St., Pasadena 4, Calif.

Feb. 8-10, 1960—AAPG: Rocky Mountain Sect., 10th Ann. Meeting, Billings, Mont.

Feb. 14-18, 1960—AIME: Ann. Mtg., Hotel Statler & Hotel McAlpin, New York, with SEcG.

Feb. 26, 1960—11th Ann. Symposium on Highway Geology, Florida State Univ., Tallahassee. Write: W. F. Tanner, Geol. Dept., FSU.

Feb. 28, 1960—SCIENCE SYMPOSIUM, Bowling Green State Univ., Bowling Green, Ohio. Speakers: Drs. Gerard P. Kuiper, George C. Simpson and Benjamin E. Howell, Jr.

Mar. 20-26, 1960—ACSM-ASP: Annual Meeting, Shoreham Hotel, Washington, D. C.

*Mar. 24-26, 1960—GSA: Southeastern Section meeting, sponsored jointly by Univ. of Kentucky Geol. Dept., Kentucky Geol. Survey, and Kentucky Geol. Soc., Lexington, Ky. Field trips (2) on third day. Write: Thomas G. Roberts, Dept. of Geol., Univ. of Ky., Lexington, Ky.

April 1-2, 1960—ALABAMA ACAD. OF SCIENCE, Geol. & Anthrop. Sect., Huntingdon College, Montgomery, Ala.

April 3-5, 1960—SEGp: 13th Ann. Midwestern Exploration Meeting, Capt. Shreve and Washington-Youree Hotels, Shreveport. Write: S. R. Marsh, The Carter Oil Co., Dr. 1739, Shreveport, La.

April 3-8, 1960—ENGINEERS JOINT COUNCIL, 6th Nuclear Congress, New York. Write: Council, 29 W. 39th St., New York 18.

April 11-13, 1960—AIME: Fifth Ann. Mining, Minerals and Petroleum Conf., Univ. of Alaska, College, Alaska. Principal speakers, Dr. James Boyd, V.P. Kennecott Copper Corp., and Dr. Joseph Gillson, 1960 Pres., AIME. Write: Alaska Sect., AIME, Box 4001, College, Alaska.

**GEOTIMES CALENDAR**

Meeting notices for the GeoTimes Calendar should be submitted in concisely edited form to:

**Mrs. Kathryn Lohman**
**GeoTimes Calendar Editor**
**2101 Constitution Ave., N.W.**
**Washington 25, D.C.**

April 21-22, 1960—AIME: Southwest Metals & Minerals Conf., Ambassador Hotel, Los Angeles, Calif.

*April 21-23, 1960—SEPM: Permian Basin Sect., Ann. Meeting, April 21, Abilene, Texas. Field conf. to study Pennsylvanian and L. Permian, April 22, 23. Write: J. P. Brand, Texas Tech. Coll., Lubbock.

*April 22-23, 1960—OHIO ACAD. OF SCIENCE, Geol. Sect., meeting, Antioch College, Yellow Springs, Ohio. Field trip Apr. 23.

April 22-23, 1960—AASG: Pennsylvania Geol. Survey, Harrisburg, Pa.

April 24-28, 1960—ACerS: 62nd Annual Meeting, Bellevue-Stratford Hotel, Philadelphia.

April 25-27, 1960—CIM Ann. Mtg., Royal York Hotel, Toronto, Canada.

*April 25-28, 1960—AAPG-SEPM: Ann. Mtg., Chalfonte-Hadden Hall, Atlantic City. Premeeting field trips and post meeting extension tours in Washington, D. C. Geol. Soc. Wash. hosts.

April 28-30—GSA: Rocky Mountain Sect. Regional Meeting, School of Mines & Tech., Rapid City, S. D.

April 28-30, 1960—AGU: 41st Ann. Meeting, Washington, D. C. This date is tentative.

*April 28-30, 1960—AIME: 13th Ann. Pacific NW Metals and Minerals Conf., Sheraton Hotel, Portland, Ore. Field trips.

May 2-3, 1960—AIME: SOC. PET. ENGNRS., Wichita Falls, Texas.

May 5-6, 1960—AIME: Ann. Joint Meeting, Rocky Mountain Petr. Sects., Calgary, Alta.

*May 6-7, 1960—GSA: Cordilleran Sect., Vancouver, British Columbia. Field trips in SW British Columbia, May 5 and May 7-9.

May 14-15, 1960—MIDWEST FRIENDS OF THE PLEISTOCENE, Ann. Meeting, Eastern South Dakota. Write: Allen F. Agnew, State Geologist, South Dakota Geological Survey, Vermillion.

May 25-28, 1960—AAPG: Western Canada Regional Meeting with Alberta Soc. of Petr. Geol. as host, Banff Springs Hotel, Banff, Alta.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19th INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

Aug. 14-24, 1960—7th INTERNAT. CONGRESS OF SOIL SCIENCE, Madison, Wisc.

*Aug. 15 - 25, 1960 — XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

Aug. 20-25, 1960—INTERNAT. MINERAL. ASSOC., 2nd General Meeting; Mineralogical Museum, Univ. of Copenhagen, Denmark.

Oct. 2-5, 1960—AIME: Soc. of Petr. Eng., Fall meeting, Denver.

Oct. 6-8, 1960—9th NATIONAL CLAY CONF., Purdue Univ., Lafayette, Ind. Write: J. L. White, Agronomy Dept., Purdue Univ.

Oct. 12-14, 1960—AAPG: SW Fed. of Geological Soc's., 3rd Ann. Meeting, Abilene, Texas.

Oct. 19-21, 1960—GULF COAST ASSOC. OF GEOL. SOC'S., Biloxi, Miss.

Nov. 7-10, 1960—SEGp: 30th Ann. Internat. meeting, Moody Convention Center, Galveston. Write: W. B. Lee, Jr., Gulf Oil Corp., Dr. 2100, Houston 1, Tex.

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The Geochemical Society recently announced that the first 250 new applicants for membership will receive on acceptance, in addition to Geochemical News, a copy of Jack Green's recent paper "Geochemical Table of Elements for 1959" (G.S.A. Bull., v. 70, pp. 1127-1184).

Application for membership in the Geochemical Society may be obtained from *Konrad B. Krauskopf Secretary, Department of Geology, Stanford University, California.*

# This Month in GEOTIMES

Professional News Magazine

*Published by* **THE AMERICAN GEOLOGICAL INSTITUTE**

Robert C. Stephenson, EDITOR

Kathryn Lohman, CIRCULATION MANAGER

VOL. IV, No. 5 JAN.-FEB. 1960





GEOTIMES is published eight times a year, January-February, March, April, May-June, July-August, September, October, November-December, by the American Geological Institute at Williams and Heintz Lithograph Division, Washington, D. C. Address all correspondence to 2101 Constitution Ave., N.W., Washington 25, D. C.

Subscriptions: GEOTIMES is distributed to members of supporting Member Societies as a part of their society membership. Non-member rates—U.S.A. and Possessions, Canada and Mexico, $2.00 per year; elsewhere, $2.50 per year. Single copy .35¢. Second class postage paid at Washington, D. C.

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# Positive Thinking

Many people have found new strength in adopting Dr. Norman Vincent Peale's "power of positive thinking." Dr. Peale contends that a person's ability to face the trials and tribulations of life is greatly improved if a person thinks positively.

Geoscientists are at a critical crossroads with respect to the future of the American Geological Institute as has been outlined in this issue by AGI's president, Raymond C. Moore. The Reorganization Committee is charged with drafting a new and more effective constitution and with developing a realistic formula by which the profession will assume a reasonable share of the basic operating costs of the Institute. Failure to accomplish these two prime objectives could lead to the collapse of AGI.

There must be emphasis on positive thinking by the Reorganization Committee, the AGI Directors and Officers, the management of the Member Societies, and the rank and file of the profession. Not only must the thinking be positive, but it must also be constructive and realistic. Many efforts to solve basic problems of AGI organization and financing have gone for naught due to a well-meaning but negative approach.

Honest thinking must go into evaluation of the Institute by the profession. How well has the AGI developed and performed? What are its accomplishments? What are its deficiencies? Has the Institution been adequately supported by the profession—morally and financially? Do you understand the Institute, its organization, objectives and program? Have you attempted to learn more about AGI?

The American Geological Institute, effectively reorganized, will serve the geoscientists of future generations. Despite the fact that AGI serves the profession of today in various ways, it should be obvious that we are shaping an organization of tomorrow—one which will gain strength and stature in the representation of the profession only as it matures. To provide an organization of maximum effectiveness will take positive thinking and positive action.

OUR COVER

The profession hails "Mr. Geology," Henry R. Aldrich who has completed 25 years of service as Secretary of the Geological Society of America. *See page 14.*

**The AMERICAN GEOLOGICAL INSTITUTE** is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

**GEOTIMES** is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences

# GEOLOGY IN FINLAND

*by* PENTTI ESKOLA [1]

*Economic Geology.* In Finland, as probably in most countries, Geology has originated in connection with mining. According to the Finnish National Epos, Kalevala, the skillful smith Ilmarinen invented the art of making iron from bog ore, and this was practiced up to the last century. The first iron mine in the Precambrian was opened at Lohja in 1540. Other mines followed, but the native production never was sufficient to satisfy the needs of the country, hence much ore was imported from Sweden. After 1809, when Finland was separated from Sweden and became an autonomic district in union with Russia, the owners of iron works feared that the ore import might stop. Therefore, in 1818, a governmental Mining Department was founded. Its first Director from 1823 to 1885 was the renowned mineralogist Nils Nordenskiöld (1792-1866). He performed energetic prospecting for ores and did all in his power to promote the exploitation of the domestic resources, e.g. by means of rewards for the enterprisers and high duty on imported ore. Many new deposits were discovered, but they were small or the ore was too low grade. During several decades the iron mines were operated at a deficit. After Nordenskiöld's retirement the duties were abandoned in 1859 whereafter mining soon almost ceased. The pessimism concerning mining in Finland found its expression in the well known words in our national anthem *"Our Land"* by J. L. Runeberg, written in 1848:

*"Our land is poor, will ever be*
*For those who long for gold . . ."*

Nordenskiöld, however, had before his retirement understood that the failure could depend upon the lack of geological investigation and had taken the initiative on geological mapping of the country. According to the memoirs of K. A. Moberg, the first director of the Geological Survey, this proposal was approved because it was supported by J. V. Snellman (the Finnish national leader), who at that time was a member of the Government. The mapping was started in 1862 and the Geological Survey was founded in 1885.

The first geological maps were rather defective owing to the lack of schooling of the geologists. The standard improved after J. J. Sederholm (1863-1934) in 1893 became director of the Survey. During his long period of leadership, till 1933, he himself accomplished a great scientific work and had the first geological mapping of almost the whole country performed. But he shared the prevailing opinion concerning the ore resources, as appears from his statement of 1901: "The future will show in what amount new deposits of ores or other valuable mineral resources will be disclosed by means of geological mapping. The investigations carried out so far make sure, anyway, that Finland is a country exceptionally poor in ores which does not mean that not, in rare cases, valuable occurrences might be found."

A new epoch of prospecting and mining was heralded by the finding of the great and rich copper ore at Outokumpu by tracing a glacial ore boulder found in 1908 by

[1] Dr. Pentti Eskola is Professor of Geology, Geological Institute, University of Helsinki, Snellmaninkatu 5, Helsinki, Finland.

This article is the third in a series of five on geology and geologists of the Nordic countries that will be hosts to the geologists of the world attending the XXI International Geological Congress, Copenhagen, August 15-25, 1960. See GeoTimes October 1959 (Sweden) and Nov.-Dec. 1959 (Norway).

canal workers at Kivisalmi, 55 kilometers southeast of the deposit. The ore body was located in 1910 by O. Trüstedt, M.E., the author of a classical study of the Pitkäranta mining field. The success in the search of Outokumpu was due to the basic research already accomplished by the Geological Survey. The directions of the movements of the glacial ice sheet were known and a fairly detailed geological map of the hard rocks of the area existed. As boulders of rocks peculiar to the Outokumpu field, such as serpentinite and skarns with chrome minerals, were found near the ore boulder, Trüstedt's attention was at once directed to that region.

The Outokumpu mine, because discovered by the Survey, came after purchase of the land-owner's part in the possession of the state. Its manager was from 1921 to 1953 Dr. Eero Mäkinen (1886-1953), also well known as an eminent geologist and mineralogist. He developed mining industry to an important factor in the country's economy, Outokumpu having been, in production, during a long time the largest copper mine in Europe. In the activity of the Geological Survey prospecting was an increasingly greater part, especially after 1935, when Aarne Laitakari became Director. As most of the ore boulders were found by rural people, he encouraged the interest to send such boulders to the Survey. Several new deposits were found and entrusted to the Outokumpu Company which, also, carries out prospecting of its own, employing nearly as many geologists as the Survey, which, moreover, pursues aerial prospecting by magnetometric and electric methods on a large scale.

About ten ore deposits have been opened since 1937, a few of them by private firms. Among the largest ones now operated by the Outokumpu concern are the zinc, copper and pyrites mines of Vihanti and Pyhäsalmi in Ostrobothnia and the Kotalahti copper and nickel mine in Savo. For the iron, titanium and vanadium deposit of Otanmäki near Lake Oulujärvi, also found by the Survey, another state-owned concern was founded, the Otanmäki Company, which is at present developing two large iron ore deposits, Kärväsvaara and Misiraaka, and investigating several other iron ore fields in North Finland.

The Geological Survey of Finland is housed in this recently completed building located in the forest area west of Helsinki, Finland.

With the modern technics even large deposits are exhausted in a relatively short time, but at present there is no fear that the deposits now known would be the last ones to be found.

### Subdivision of the Precambrian

Wilhelm Ramsay and J. J. Sederholm share the merit of having brought geological research in Finland to a modern level. The former, professor of geology at the University of Helsinki, was first best known for his investigations on the Kola Peninsula and East Karelia, which led him to propose the name Fennoscandia, now in general use. In his later years he did basic research on the Pleistocene and its subdivision, and on the isostatic and eustatic phenomena. Sederholm acquired a worldwide fame by his work on migmatites and the granite problem. In his tireless research on the Finnish Precambrian he paid most attention to its subdivision into age-groups. In this he was not always fortunate. In the following this side of his work will be reviewed in some detail, as some misunderstandings still prevail among foreign geologists concerning the rock formations of Finland.

From western Finland Sederholm described, in 1899, a zone of exceedingly well preserved varved pelites, arkoses, conglomerates, and volcanites, admirably expounding their evidence for the actualistic principle, which he brought to a definite victory. This zone, stretching from west to east north of the City of Tampere,

*(Continued on page 39)*

*An Issue of Vital Importance*

# Can AGI Survive?

by RAYMOND C. MOORE [1]

The American Geological Institute in 1960 faces its greatest crisis. "To be or not to be, that is the question." The purpose of this article is to report on important actions now in progress that will determine the future of AGI. Shall our organization of earth-science professions move forward or disappear? As a member of one or more of the AGI constituent societies, it is for you to say.

Since July 1956, when the first issue of GeoTimes appeared, the many thousand persons who belong to earth-science professions in North America (and to some extent in other continents) have had opportunity to learn about existence of the Institute. In varying degree they know how the earth-science societies, including several of international scope, got together in order to advance their common interests. They are at least partly acquainted with accomplishments so far attained and they understand the value of co-operation and coordination in improving the status of earth scientists, in promoting earth-science education, and in securing steady enlargement of employment opportunities in this field.

Few earth scientists are opposed to enhancement in prestige of their profession or to objectives set forth to guide AGI, but very many have not yet come to feel that such matters affect them personally. As GeoTimes is found to contain more and more information of interest to them—for example, such articles as "Professional Dimensions of the Geosciences" and several others in the 60-page November-December, 1959, issue—they give it increased attention, but their attitude generally is passive; they accept something done gratuitously for them by someone, without thought of support that might be furnished by themselves.

Several influential groups of earth scientists that until now have furnished the bulk of financial support for essential AGI operations consider that now the time has arrived when we must end hand-to-mouth dependence of annual budgets on "donations" of member societies and voluntary "dues" paid by individuals who join the Committee of 100 or Committee of 1000. A way must be found for the profession as a whole to underwrite appropriate costs of advancing its collective interests, or efforts along this line may have to be abandoned, despite accomplishments of AGI during the last 11 years. That a crossroads situation confronts us is not merely an opinion of the AGI Executive Committee and various present Directors. It is a fact attested by the announced intention of major member societies to withdraw unless an acceptable revision of financing methods and administration can be formulated without delay. Equitably distributed support from the whole profession is demanded. Accordingly, a "grass-roots" poll of approximately one-fourth of the entire AGI mailing list was undertaken in December, 1959, in order to obtain a representative expression of the willingness or unwillingness of individuals to be assessed a modest share in the costs of promoting the earth-science professions. Expense of the poll is paid by friends of the Institute, returns to be compiled by the Illinois Geological Survey as a service to the profession.

### AGI REORGANIZATION COMMITTEE

At the annual meeting of the Institute held in Pittsburgh, Pa., on 4 November, 1959, the Directors gave special attention to questions relating to its future. A report with accompanying recommendations

[1] Raymond C. Moore, President, American Geological Institute, Professor of Geology, University of Geology, Lawrence, Kansas.

was received from Carey Croneis as chairman of the AGI Evaluation Committee appointed by President J. V. Howell in 1958; also heard were reports of AGI study committees representing AAPG-GSA-SExG (M. P. Billings, chairman) and AAPG-GSA (A. R. Denison, chairman), as well as views reflecting the sentiment of other AGI member organizations. The Directors then voted to establish an "action committee" to be appointed without delay by the President for the purpose of preparing specific proposals for reorganization of the Institute. The constitution and bylaws require change, and provision must be made to secure stable financial support in some equitable manner from individuals belonging to earth-science professions. The task assigned to this committee obviously is one of extreme difficulty, particularly in view of near-immediacy in necessary accomplishment of its mission. This is because proposals to member organizations must be ready for submittal before the time of meetings scheduled in April, 1960. "Action" was called for and this has been interpreted to mean something much faster than a glacial pace.

An AGI Reorganization Committee has been appointed. It consists of nearly 75 persons, mainly younger men rather than much-used older "wheel horses," chosen with a view to obtaining a best-possible profession-wide representation from all regions, including Canada and Mexico in addition to the United States. As chairman of this important committee, B. Warren Beebe, of Boulder, Colorado, was selected, a widely acquainted, energetic and able geologist who is a member of AAPG GSA, SExG, and various other earth-science societies. Thorough dedication to his profession is indicated by Mr. Beebe's acceptance of the responsibility in leading this committee. Working with him as an executive group are J. Robert Berg (Wichita), George V. Cohee (Washington), Sigmund I. Hammer (Pittsburgh), George C. Hardin, Jr. (Houston), William B. Heroy, Jr. (Dallas), and Noel H. Stearn (Portola Valley, Calif.); these men have arranged for meetings together, whereas other members of the committee are to be consulted and to contribute only by correspondence. The committee has been organized to deal with assigned aspects of the whole problem.

In addition to the AGI Reorganization Committee, an advisory "Cabinet" consisting of all Past Presidents and members of special AGI study committees has been appointed for such help as they can furnish. This group includes C. C. Albritton, H. R. Aldrich, Gordon Atwater, M. P. Billings, W. H. Bucher, O. C. Clifford, Ernst Cloos, Carey Croneis, A. R. Denison, R. H. Dott, E. A. Eckhardt, J. L. Gillson, W. B. Heroy, H. G. Hershey, H. H. Hess, J. V. Howell, Marshall Kay, M. M. Leighton, A. I. Levorsen, C. R. Longwell, P. L. Lyons, E. V. McCollum, W. W. Rubey, R. J. Russell, R. R. Shrock, N. H. Stearn, and L. G. Weeks.

### Work Assigned to Reorganization Committee

The charge to the "action committee" serving with Warren Beebe as chairman is two-fold: (1) preparation of a new constitution and bylaws for more effective administration of an intersociety organization in the earth-science field; and (2)

## Can AGI Survive?

*We focus your attention on several of the key statements by AGI's President, Raymond C. Moore.*

**. . . "Few earth scientists are opposed to enhancement in prestige of their profession or to the objectives set forth to guide AGI, but very many have not yet come to feel that such matters affect them personally."**

* * *

**. . ."A way must be found for the profession as a whole to underwrite appropriate costs of advancing its collective interests (through AGI) . . . Equitably distributed support from the whole profession is demanded.**

* * *

**Action objectives are ". . .**
**(1) preparation of a new constitution and bylaws for more effective administration of an intersociety organization in the earth-science field;**
**(2) formulation of a sound program of financial support for this organization by the profession.**

* * *

**. . ."We have come to a critical juncture. Our (AGI) survival depends on ourselves."**

## CAN AGI SURVIVE?

*(Continued from page 11)*

formulation of a sound program of financial support for this organization by the profession. In one way or another it seems necessary to collect from individuals concerned with the status of their profession the bulk of funds required for adequate basic operations of organization services (excluding moneys received as grants for special purposes). The principle of equitable distribution of the financial load on individuals seems to be sound, the essential problem being how to effectuate it.

Various member societies of the present AGI oppose even a modest per capita assessment on their membership, because generally this would call for an increase of dues and because multiple society memberships of most individuals would impose hardship on them in bearing an inequitable share of assessments. To revise the structure and financing of an earth-science intersociety coalition (such as present AGI) by calling for membership of individual persons who pay annual dues directly to this joint organization is advocated by some but strongly opposed by many who judge that this would (1) create just another society competing with those it is presumed to serve; (2) place a disproportionate load on the willing for benefit of a host of "free-loaders;" and (3) probably fail to yield adequate financial support. Then AGI would disappear. A widely held view, to which I subscribe is that support of an intersociety professional organization by individuals must be worked out by utilizing the member societies as channels, that this can and must be developed so as to avoid multiple assessments on individuals, and that we may hope to receive the backing of member societies in the form of assurance to continue the present level of AGI support during a reasonable transition period of financial readjustments. These are the problems given to the Reorganization Committee.

### Goals Important to Earth-Science Professions

In my opinion two goals presently loom as specially desirable for achievement of earth-science professions in our part of the world. First is a means of distinguishing and then of announcing professional competence, by which individuals adequately trained and experienced may be differentiated from those not (or not yet) entitled to such recognition. Acknowledgment of professional competence is worth striving for both in commercial and academic fields. By setting up proper criteria for this evaluation an intersociety organization may establish needed definition of a threshold level of achievement in earth-science disciplines and at the same time become recognized as an agency that touches each individual very directly. Then the professional status of competent workers in all branches of earth science would become recognized. Possibly the creation of an Institute of Earth Sciences within the framework of a Federation of Earth-Science Societies replacing the present AGI would provide a mechanism for listed membership of individuals having approved attainments. Development along some such line is suggested by Warren Beebe, and if adopted, it seems to me that earth-science professions would be strengthened.

A second goal is internationalization of earth-science professionals, primarily in North America but not necessarily so restricted. Most of the present member societies of AGI include many Canadians, Mexicans, and other nationals who should be quite as much concerned and as well served as earth scientists who are citizens of the United States. If this goal is to be achieved, reorganization of the concerned professional groups needs to contemplate severance of relations that now tie AGI to the National Academy of Sciences and National Research Council of the United States. Sponsorship by these agencies was a vital factor in the birth of AGI, as was gratefully acknowledged in the 10-year Anniversary number (October, 1958) of GeoTimes. Now, it seems that the fledgling has strengthened its muscles and grown enough feathers to fend for itself. When it undertakes to do so, it is hoped that the blessing of NAS and NRC will not be withheld.

Thus we have come to a critical juncture. Our survival depends on ourselves.

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## Graduate Study Opportunities in Russia

The Inter-University Committee on Travel Grants has announced that it is soliciting applications for a possible exchange program in 1960-1961. The Committee has conducted exchanges of graduate students with the Soviet Union during the period 1958-1960 under agreement between the United States and the U.S.S.R.

Closing date for applications is February 15, 1960. The announcement and instructions for applying may be obtained by writing *Inter-University Committee on Travel Grants, 409 West 117th Street, New York 27, N. Y.*

## Indiana University Summer Institute in Field Geology

Indiana University has announced a Summer Institute in Field Geology for College Teachers of Geology for the summer of 1960, aided by a grant from the National Science Foundation. The Institute will be conducted from June 20 to July 30 at the Indiana University Geologic Field Station in the Tobacco Root Mountains, South of Cardwell, Montana.

The purpose of the program is to provide the opportunity for geology teachers at the college level to broaden their field experience through a concentrated study of the geology of the northern Rocky Mountains. Director of the Institute will be Professor Wayne R. Lowell of the Indiana Faculty, assisted by Professor Raymond Gutschick of the University of Notre Dame. Seven faculty members of the regular college summer camp staff will assist and there will be five well-known geologists visiting for short periods during the Institute.

Registration for the Institute will close on February 15, 1960. More information may be obtained by writing *Wayne R. Lowell, Department of Geology, Indiana University, Bloomington, Indiana.*

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## NAGT Elects 1960 Officers at Columbus Meeting

The National Association of Geology Teachers met in Columbus, Ohio, on December 5, 1959, and elected the following officers for the coming year.

*President:* Carey Croneis, The Rice Institute

*Vice President:* Charles D. Campbell, Washington State University

*Secretary:* Freeman Foote, Williams College

*Treasurer:* Sheldon Judson, Princeton University

*Editor:* Robert L. Bates, Ohio State University

Representing the NAGT on the AGI Board of Directors will be J. Robert Berg, University of Wichita, reappointed for a second two-year term, and Carey Croneis to fill the unexpired term of S. P. Ellison. Ellison now represents the Society of Economic Paleontologists and Mineralogists on the AGI Board of Directors as President of SEPM.

## Warren Beebe Heads AGI Reorganization Committee

B. Warren Beebe, independent petroleum geologist of Boulder, Colorado, has been named Chairman of the AGI Reorganization Committee by the Institute's president, Raymond C. Moore. Beebe holds membership in five of the fourteen AGI Member Societies. These are GSA (Fellow), AAPG, AIME, SEGp, and AGU.

Warren has been particularly active in the affairs of the AAPG. He served as Vice-President and member of the Business Committee in 1956-57. He was Chairman of the AAPG Distinguished Lecture Committee, 1956-1959, and in this capacity became widely acquainted with local society officials. In 1955 he was the recipient of the first meritorious service award by the University of Wichita where he studied as an undergraduate.

He has published a number of papers on mid-Continent geology, and in recent years has shown great interest in the problems of developing a stronger profession with higher standards. Last year he was appointed Chairman of the AGI Study Committee on Professional Standards, a post which he still holds.

Serving with Chairman Beebe on the Executive Group are those men listed below:

AGI Reorganization Committee
Executive Group

*B. Warren Beebe,* Chairman
*J. R. Berg,* University of Wichita
*George V. Cohee,* U. S. Geological Survey
*Sigmund I. Hammer,* Gulf Research & Dev. Co.
*George C. Hardin, Jr.,* Michel T. Halbouty, Consulting Geologists
*William B. Heroy, Jr.,* Geotechnical Corp.
*Noel H. Stearn,* Consultant

# HENRY R. ALDRICH

## A master craftsman of the *modus operandi*

*by* PAUL F. KERR [1]

The post of Secretary is the most important position that The Geological Society of America provides. Society presidents come and go, councilors serve for limited terms, committee assignments extend for a short span of years, but the tenure of the Secretary is continuous. As the permanent administrative officer he, more than anyone else, carries the responsibility for maintaining a coherent, progressive and effective organization devoted to the advancement of the science.

For 25 years the science of geology in North America has had the good fortune to reap a great harvest of benefits from that master craftsman, Henry R. Aldrich, who has served The Geological Society of America so well: first as Assistant Secretary and Editor-in-Chief from 1934 to 1940 and then as Secretary, Councilor and Editor-in-Chief from 1940 to the present. Since he is soon to retire, at his own request, it is particularly appropriate to acquaint the readers of GeoTimes of this event and to suggest that the many who are numbered among his friends may wish to convey to him by means of a pleasant word at a meeting, a telephone call, a letter, or even a telegram, some form of personal acknowledgment for a job well done.

The role of Secretary to a large society is far from easy. The daily tasks are sufficient to take more than the normal hours in a day and leave little time for the planning and organization of major problems. Yet Dr. Aldrich has organized the staff at Society headquarters so well that not only do routine problems receive prompt attention, but time is available to devote to vital developments and plans for the future. He has been the captain of a most important team, a team which is wholeheartedly devoted to its leader and exhibits unswerving loyalty. He is also the hardest working member of the group, leaving his home in Leonia, New Jersey, every morning in time to be at his desk by eight o'clock. At the same time his evenings and week ends are often occupied in attendance at committee meetings.

To geologists of the United States, Canada, as well as other countries throughout the world he has become known as "Henry Aldrich"—and frequently merely as "Henry." With patience, a fine sense of humor, keen insight and rare good judgment he has guided the destiny of the Society. He was trained at the Massachusetts Institute of Technology as a mining engineer and received his B.S. degree in 1914; he continued his education as a geologist at the University of Minnesota (M.S. 1917) and at the University of Wisconsin (Ph.D. 1931). He was serving as Assistant State Geologist with the Wisconsin Geological Survey when called to Geological Society of America headquarters in 1934.

If one wishes to learn more fully of the *modus operandi* of Henry Aldrich, he should read with care the Interim Proceedings of the Society particularly as they concern the Office of Secretary. These reports reflect the early engineering training of the Secretary and are effectively illustrated with curves which show at a glance

[1] Dr. Paul F. Kerr, Newberry Professor of Mineralogy, Columbia University, is a long-time friend of Dr. Aldrich. Professor Kerr kindly consented to prepare this tribute.

**HENRY R. ALDRICH**

**Vita**

| | |
|---|---|
| Henry Ray Aldrich; born, June 8, 1891 | |
| B.S. Mining Engineering, M.I.T. | 1914 |
| M.S. Geology, University of Minnesota | 1917 |
| Ph.D. Geology, University of Wisconsin | 1931 |
| Hon. D.Sc., Tufts University | 1955 |
| Instructor, Northwestern University | 1914-1916 |
| War Industries Board | 1917-1919 |
| Instructor, M.I.T. | 1920 |
| Wisconsin Geological Survey | 1919-1934 |
| Geological Society of America | 1934- |
| Home address: 200 Van Orden Ave., Leonia, New Jersey | |

the status of the Society in all critical aspects. Two curves, which summarize in an abbreviated form many that Henry has made, have been prepared for this account. One pictures the phenomenal growth of the Society during the years that Henry has been Secretary; the other records the threefold increase in the scientific publication of the Society since his arrival at headquarters. Comparison of early papers with present day contributions will likewise substantiate a marked improvement in quality and format.

These two curves, the first concerning the number and stature of geologists, the second indicating their scientific output, are symbolic. Henry has long taken as his motto the objective of the Society he guides—the promotion in North America of the science of geology. If a paper is presented for publication, the question he asks first is: does it advance geologic science even if only in a small way? If memberships or fellowships are to be increased, he always inquires whether the long range effect will be beneficial. Progress has always been uppermost in his mind.

Henry would be the first to disclaim his competence as a business man, yet he has occupied a critical post at the helm of what is essentially a six million dollar corporation. Much of the business competence that the Society has shown in properly utilizing its resources may be directly attributed to the sagacity of Henry Aldrich in ferreting out the names of able geologists to be suggested to the Council for committee appointments.

Notwithstanding the importance of the post of Secretary and the influence which a Secretary justly exercises, the self-effacing manner in which Henry has occupied his position has seldom been equaled. At annual meetings he may be seen frequently in the corridors—but rarely on any platform. At sectional meetings, many of which he attends, he remains an observer. In Society affairs he is constantly asked to act as an advisor to other officers and committees, but he never uses his position to dictate policy. His influence on the Society has perhaps been greater because his results have been accomplished by al-

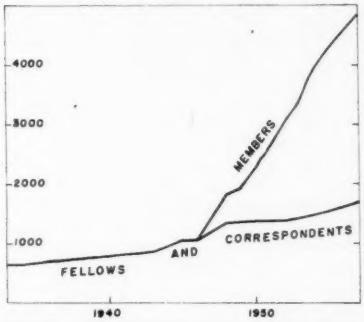


**FIGURE 1: Membership curve, Geological Society of America, 1933-1958.**

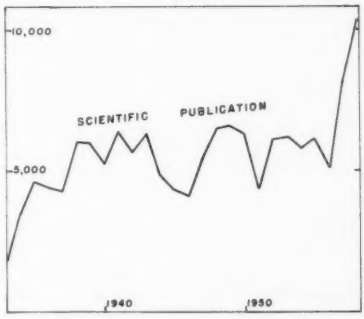


**FIGURE 2: Comparative annual publication, Geological Society of America, 1933-1958 (adjusted in terms of equivalent pages).**

ways working through established channels. Yet his has been the guiding hand which has quietly, but effectively kept a large organization functioning smoothly.

Henry has several distinguishing characteristics which have become familiar to those whose privilege it has been to see him in the course of his daily business. He has always been particularly interested in the younger members and fellows of the Society and frequently takes time from an active day to guide some young geologist toward a better understanding of the science. He is also concerned with the visits to headquarters of geologists from other lands and often goes out of his way to make their stay in the United States more enjoyable. He is especially sympathetic with those geologists who, for example, residing in some distant area far from headquarters in New York, suddenly decide that the Geological Society is mistaken in its approach to geologic problems. Letters then come to the Secretary furnishing a new formula for operation procedures. There have been many understanding letters documented with facts and figures which have been sent from the Secretary's office in an attempt to explain the operations of the science and the Society while still showing an appreciation for the ideas put forth in the sender's letter.

A national society represents a forum before which many different viewpoints are entitled to be heard and in which many influences of a diverse nature exist. University groups, state and governmental organizations, professional groups and sectional organizations each ask, and are entitled to receive, proper consideration from Society headquarters. No judge on a Federal bench has exercised greater impartiality or discernment in the handling of different problems with conflicting interests than has Henry Aldrich in his position as Secretary of the Society. Also, few officials have exercised greater discretion in respecting confidences with which they have been entrusted.

Over the years an effective system of committee administration has been evolved to regulate Society decisions on important matters. Committees which cover Policies, Program, Publications, Budget, Finance, and other areas of endeavor work out the major problems of the Society and formulate recommendations submitted to the Council for decision. Henry Aldrich has served as an ever-present source of factual data for these committees and has always been willing to answer questions when asked; he has, however, conscientiously refrained from participating in committee decisions themselves. Because suggestions might be misconstrued as mandates and subject to controversy, the Secretary has maintained a sincere impartiality – and thereby gained the further respect and admiration of all segments of his vast organization while maintaining solidarity in the group.

A large part of the success that Henry Aldrich has enjoyed as Secretary of the Society may be attributed to his basic education in geology and his experience for 15 years with the Wisconsin Geological Survey. During his service with the Wisconsin Survey he mastered the geology of the Gogebic Iron Range, became proficient in the interpretation of magnetic anomalies and contributed to a better understanding of Wisconsin geology. A large number of excellent publications under his authorship stand in the geologic record as evidence of this accomplishment.

Despite Henry's devotion to the Secretaryship, his family has received his faithful attention. He married Louise Clement on June 11, 1918 and they have two sons. Richard is an engineer and physicist at the Electronics Laboratory of the General Electric Company in Syracuse, New York, and is working on solid state physics in the field of semiconductors. Robert is a forester with the U. S. Forest Service at Beltsville, Maryland, and is engaged in aerial photographic interpretation. The three men of the Aldrich family—Henry, Richard and Robert—occupy half of the Aldrich representation in American Men of Science!

Henry's one weakness—if it can be construed as a weakness—has been his continued, but frustrated support of baseball's Boston Red Sox *(the author admits to being a Yankee fan)*.

The word "retire" is inappropriate as a term to describe the voluntary status that Henry Aldrich has elected to assume. He leaves his post in his twenty-sixth year with the Society while his judgment is at its keenest and his efficiency is undiminished by the passage of time. Let us say that the word "inaugurate" is more accurate in Henry Aldrich's case and that the termination of his active status as Secretary of the Society is to mark the beginning of a new epoch of useful activity during which time the accumulated experience of the Wisconsin Survey and the past quarter century with the Society may continue to be effectively applied in the interest of geological science.

We salute you, Henry Aldrich, as you start your new role of service. We are sure it will be an active one in which all of the many talents you have so remarkably demonstrated during the past years will be ably employed. We look forward to seeing you along the frontiers of geologic knowledge for many years to come.

## Texas A&M Graduate Aid

The Department of Oceanography and Meteorology at the A. and M. College of Texas has announced the availability of fellowships and research assistantships to qualified graduates in physics, chemistry, geology, meteorology, biology and engineering for 1960-61. Included are four fellowships with stipends ranging from $2,000 to $3,000 and research assistantships providing $1,800 and upward for 12 months.

Fields of emphasis include interaction between ocean and atmosphere, marine meteorology, radar meteorology, ocean waves and wave forces, weather analysis, water level problems, micrometeorology, agricultural meteorology, marine geochemistry, carbon dioxide relationships in the sea and atmosphere, radioactive and industrial waste disposal, comparative biochemistry of marine organisms, organic composition of marine sediments, demineralization of sea water, estuarine pollution, coastal and estuarine geology, trace minerals, and bacteria-phytoplankton relationships in the sea.

Application forms may be obtained from the *Head of the Department of Oceanography and Meteorology, the A. and M. College of Texas, College Station, Texas.*

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## UCLA Holds Conference on Fluids in Rocks

A two-day conference on Fluids in Rocks, analyzing the movement of oil, gas and water in porous rocks and soils, will be held Jan. 29 and 30 at the University of California, Los Angeles.

Discussion will center on the fundamentals and on new approaches and tools for solving water, oil and gas problems, according to Dr. John C. Crowell, chairman of the UCLA geology department.

The conference, sponsored by the UCLA departments of geology and engineering and University Extension, will allow an exchange of views among petroleum, water and foundation geologists; reservoir, foundation and construction engineers; and hydrologists and exploration geophysicists.

Speakers will include Gilman A. Hill, president of the Petroleum Research Corp., Denver; H. E. Skibitzke, U.S. Geological Survey; Robert Thomas, California State Department of Water Resources; Gerald W. Johnson, associate director of the Lawrence Radiation Laboratory; and UCLA professors Martin R. Huberty, George C. Kennedy and U. S. Grant.

Dr. Frederick Betz, Jr.

## Fred Betz Joins GSA Staff

Dr. Frederick Betz, Jr., has been selected by the Council of the Geological Society of America to succeed Dr. Aldrich as Secretary of the Society. Dr. Betz is currently in Germany with the Military Geology Branch of the United States Geological Survey. He has been on staff of the U.S.G.S. since 1943. His interests have been in economic geology, oceanography and military geology. Dr. Betz is a native of Rochester, New York, received his undergraduate training at Columbia and was granted the Ph.D. degree by Princeton University in 1938. He spent two years on the staff of the U.S. Bureau of Mines before joining the Survey staff and in 1946-47 taught at Lehigh University. He worked on several occasions for the Newfoundland Geological Survey.

Dr. Betz went to Germany in 1948 for the U. S. Geological Survey. In 1952 he was sent to Austria and in 1954 again to Germany where he has remained until the present. He brings to his new post a great interest in strengthening international ties between geologists.

Dr. Betz is expected to report to the Geological Society of America on February 1, 1960 and within several months will succeed Dr. Aldrich who will retire shortly thereafter as Secretary.

L. U. de Sitter

**AGI Sponsors**

# VISITING INTERNATIONAL SCIENTIST PROGRAM

During the coming months the American Geological Institute, aided by a grant from the National Science Foundation, will sponsor visits of four internationally-known geologists to the United States for lecture visits to university departments of geology-geophysics.

Scheduled to visit this country are Professors Paul Ramdohr, L. U. deSitter, Augustin Lombard and Dr. Stevenson Buchan. Each of the visiting scientists will be in the U.S. for approximately three months. During this period they will each make eight one-week visits to college departments to lecture and discuss geological research. The visitors will have a certain amount of free time to visit research laboratories and other institutions during their stay in the U.S. The program is intended primarily for the graduate departments offering a Ph.D. program, as contrasted to the AGI Visiting Geoscientist Program through which U.S. scientists make visits to the smaller departments.

Dr. Jacques Bourcart, Professor of Physical and Dynamic Geology, Faculty of Science, University of Paris was also invited to participate. Professor Bourcart had accepted but in late December found it necessary to cancel his plans to come to the United States.

Dr. Paul Ramdohr is Professor Emeritus, Mineral Institute, University of Heidelberg, Germany. He is a member of the Academies of Berlin, Heidelberg and Vienna. He has been elected corresponding member Geologiska foreningen of Stockholm, the Geological Society of America and the Geological Society of London.

Professor Ramdohr is best known in this country for his research in the field of ore microscopy. He is co-author of two textbooks—one on mineralogy and another on ore microscopy. His scientific research in the field and laboratory covers mineral deposits of many of the areas of the world.

Dr. L. U. deSitter is Professor of Structural and Applied Geology at the University of Leiden, Holland. Dr. deSitter is the author of many scientific publications including the textbook *Structural Geology* published by McGraw-Hill in 1956.

Professor deSitter is the son of the famous astronomer, Willem deSitter. He is a corresponding member of the Geological Society of America. Following completion of his graduate work he was employed by Shell in Venezuela and later in Java. Since joining the Geological Institute at Leiden in 1934 he has carried out

Augustin Lombard

Paul Ramdohr

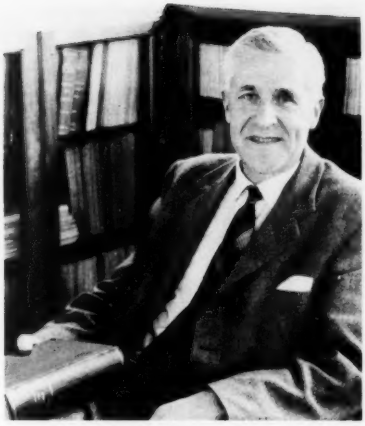
field mapping in the Alps, Sweden, Algeria, Morocco and in more recent years in the Central Pyrenees and Cantabric Mountains of Spain.

Dr. Augustin E. Lombard is on the staff of the Department of Geology of the University of Geneva, Switzerland. He has taught at the University of Brussels and the University of Geneva. In 1948 he was a visiting lecturer at the University of Pittsburgh. Among his society affiliations he holds membership in the American Association of Petroleum Geologists and is a fellow of the Geological Society of America. He was awarded the Great Gold Medal of the Society of Geography of Paris in 1952 for his work on the structure of the Himalayas and was awarded the Plantamour-Prevost Prize of the University of Geneva.

Professor Lombard is a specialist in sedimentation and stratigraphy. He has academic background in civil engineering as well as geology.

Dr. Stevenson Buchan is Chief Geologist of the Water Division of the Geological Survey of Great Britain. A graduate of the University of Aberdeen, his principal area of research has been in the field of hydrogeology. His lectures will deal with principles of groundwater geology.

Dr Buchan holds membership in a number of scientific and technical societies including the British Geological Society and the Geological Association. He has been honored by the Lyell Fund of the Geological Society, the Bronze Medal of the Institution of Public Health Engineers and the Ganz Medal of the Society for Water Treatment and Examination.



Stevenson Buchan

## Pennsylvania Teacher Training

The Earth and Space Science Course being introduced into Pensylvania schools during this past year by the Department of Public Instruction has been mentioned in several past issues of GeoTimes.

To meet the need for teacher-training in the earth sciences six Pennsylvania colleges and universities are holding summer institutes which will direct attention to the earth sciences. These are Lehigh, Lafayette, Franklin & Marshall, Temple, Penn State and California (Pa.) State Teachers. These institutes, made possible by grants from the National Science Foundation, are open to qualified junior and senior high school teachers. Inquiries and applications for participation should be directed to the colleges.

## IUGG Plans

A program in Vulcanology, Geochemistry and Petrology is being organized for the Helsinki meeting of the International Union of Geodesy and Geophysics July 25-August 6. Symposia on Geochronology, High Pressure Chemistry, Isotope Geology, Atmospheric Chemistry, as well as a general program in geochemistry and petrology, will take place beginning July 24 and going through July 28. Announcement of the detailed program will be made later this spring.

# Soc et tuum

## (Vigil)[1]

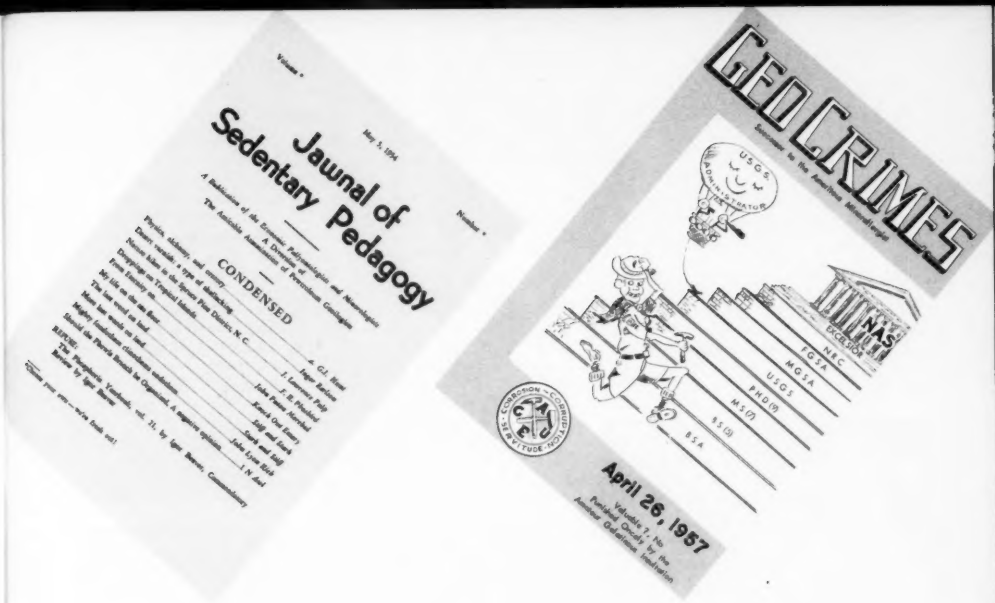
The Pick and Hammer Club was established in a modest way in December, 1894, by seven junior geologists of the Geological Survey in Washington. The purpose of the club then—as it is now—was to stimulate interest in the earth sciences through sponsorship of lectures and discussion groups. Informality has been the watchword of the club since its inception and although there are vague reports of records having been kept in the early days, none have survived. It has been alleged that the name of the club was derived from the fact that a speaker was likely to be picked on by some of the members (the youngers ones) and hammered on by others (the older ones). Be this as it may, the meetings, which run the gamut of geogolic thoughts, theories and fantasies, are held in a somewhat heckling (not quite taunting) spirit but are always broadly courteous.

A diet of geological talks began to pall very early in the game on the members of the club, so a dinner was held in 1895. This proved so popular that the dinner meeting became an annual affair. The spirit of heckling was carried over to these dinners, in the form of skits which were aimed at this or that geologist whom the members thought was overstepping the bounds of geologic thinking or action. There is a popular tradition that the Press Club's famed annual gridiron shows caught their pattern from these heckling skits about 1911. This cannot be vouched for but certainly the two have run parallel courses since then; the Pick and Hammer Club has elaborated much more on the custom. Graduation from the banquet medium to the stage facility for presenting a full fledged review apparently took place in the middle 20's, when the annual show followed by a dance and harmless refreshments was held in a hall equipped with a stage. In the 30's the show was commonly patterned after a well-known piece of fiction, such as "Malice in Blunderland" and "That Wizard of Ours." A fully organized stage show, running upwards of two hours (or until the weary actors run out of script and ad libs), has been the mode since 1949. Elaborate costuming and special scenic effects are characteristics of the shows. The authors of these epics remain strictly anonymous for obvious reasons. Among the most notable shows of the past few years have been "Van Winkle Rides Again, or, Twenty odd years in a Vug," "The Thousand and one Nuts, or Who Put the Washington Daze in the Arabian Nights," "Peter Pun, or The Light that Nearly Failed," and the memorable GSA play of 1950, "The Last Days of Pomp, or, Jason's Golden Fleecing," the latter done, more or less, in the ancient Greek tradition. It is really impossible to do justice to the plots of these shows; the last man who tried, is doing very nicely, thank you. He's due to be discharged from the hospital next week.

Here is a brief synopsis of "The Last Days of Pomp," or "Jason's Golden Fleecing." The play opens on a scene showing a Temple on the Isle of Atlantis erected to the great God Lithos. The high priests of the Geosophical Society of Atlantis, called Fellows, included among their number Batemanosthenes, Dunbaroderus, Mooreschylus, Buchericarus, and Ewingimenes. They were served by their tattered lackies, called Members. Into this crowd came Jason, with his freshly printed PhD degree clutched in his hand. The PhD, Jason thought, could get him into the high Priesthood of the Geosophical Society. Of course, the high priests were horrified, as nobody could become a Fellow just like that. Jason, however, was insistent, so the Fellows, snickering among themselves, said he could join their band provided he would bring in a bit of the original magma, a fossil of the original life on earth, and a wisp of the original cosmos from which the earth was made.

What the Fellows didn't know, and who could blame them, was that high on a

[1] Motto of the Pick and Hammer Club, Washington, D. C.




mounta. peak in Atlantis, Zeus, Poseidon, and Pluton were observing all this. The Gods were angry, for instead of worshiping them, the people of Atlantis were bowing down before the false god, Lithos, a god which consisted of nothing more than "—minerals and stones and fossil shells and barren bones." A lesson obviously had to be taught these people. While the gods were debating what should be done, Jason came along with his troubles. The gods, thinking to punish the high priests of Atlantis, helped Jason with his tasks.

When Jason showed up at Atlantis with his hand specimens, the high Priests were shocked. They decided that Jason couldn't join their band anyway. This made the gods angry, so they destroyed Atlantis, sinking it beneath the waves.

The contributions of the show to the general knowledge of geology were, of course, fabulous. Not only was the present day world allowed a look at a bit of the original magma, a fossil of the first life on the earth and a wisp of the cosmos from which the earth was created, but with the sinking of Atlantis, an entirely new concept of the forces that cause diastrophism was introduced into the geologic literature.

Although most of the shows are written about the Geological Survey, the show for 1960 is going to feature the American Association of Petroleum Geologists, as it will be held after their annual meeting. It is rumored from those who have had a sneak peek at the script that the brass and the customs of the AAPG are coming in for their share of heckling. The Pick and Hammer type heckling takes the form of songs, witty remarks, and gags; but the shows are especially remembered for their songs. To cite the most classic example, the following gem from the 1948 show is said to have kept in line many a geologist who had a tendency toward becoming pompous.

The Tune: Pretty Baby:

*Everybody loves a doctor; that's why I'm*
*in love with me—*
*Call me Doctor, call me Doctor—*
*And whenever you address me, don't*
*forget the PhD.*
*Call me Doctor, call me Doctor—*
*For I'm just a little better than the*
*average sort of man*
*Could ever hope to be;*
*So in grateful recognition, all you lesser*
*mortals can*
*Call me Doctor—that's me!*

Another, aimed at taking a poke at a geologic idea that seemed to be getting too big for its britches was the following entitled "Low magmafication," sung to the tune K-K-K-Katy.

*Granitization,*
*Granitization,*
*That's the only theory that I adore!*
*I am a juicer,*
*And a producer*
*Of papers, manuscripts, and treatises*
*galore.*

*Magma injection*
*Crystal convection–*
*They are not the simple facts that they appear;*
*Albitization,*
*Silicification–*
*Now you use the words I like the best to hear.*

Or perhaps this strikes a familiar chord. This one which was sung in 1908, was entitled "Carmen Physiographicum." Tune: "Die Lorelei"

*Our most religious science*
*is physiography*
*It cultivates reliance*
*In things no man can see.*
*It makes the mountains of the past*
*Loom rugged, high and dense,*
*While lofty summits of today*
*Appear like thirty cents.*

Here's one from the 1916 show entitled "The physicochemical view," sung to "The flowers that bloom in the Spring," from "The Mikado":

*The physico-chemical view, tra la,*
*Is one to which all must adhere;*
*For it tells you the things that are true, tra la,*
*And all else is wrong that you do, tra la,*
*And makes you feel foolish and queer.*
*And that's what we mean when we say unto you*
*"Stick close to the physico-chemical view."*

And then there's this rouser from the 1935 show. It's called "Diggsie." The tune, needless to say, is "Dixie."

*Geologize in the land of cotton*
*Dig for the rocks that are soft and rotten,*
*Dig away, dig away, dig away Dixie land*
*In Georgia mud there is much glamour,*
*There you throw away your hammer*
*Dig away, dig away, dig away Dixie land.*

Chorus:

*For geology in Dixie, Hooray! Hooray!*
*In pine tree's shade I wield my spade*
*To find a rock in Dixie:*
*A spade, a spade will find the rocks in Dixie.*

*Ten foot down and the mud gets thicker*
*Stop for a drink of raw cawn likker*
*Swig away, swig away, swig away Dixie land.*
*Just squiggle the mud between your fingers*
*Carolina schist if the mica lingers*
*Dig away, dig away, dig away Dixie land.*

**MINERALESIA**

**For those who have been involved with the Pick and Hammer, the show for 1937 stands out as one of the best. The setting of this show was on an island somewhere in the South Pacific. Many years before the show opened a ship was wrecked on the island and the sole survivor was a geologist, who managed to save only one thing, a volume of Van Hise's "Treatise on Metamorphism." The sole survivor taught the king of the island English from the Treatise, and from this the king became an enthusiastic geologic buff. He renamed his island Mineralesia, and rechristened all his subjects with geologic names. He called himself king Albite. The sole survivor became Anorthite, the High Priest. Other island inhabitants were Prince Willemite, Noseyanne, the duchess of Girthite and several ladies in waiting. To the island comes the Good Ship G. S. A., which upsets the equilibrimum of those on the island.**

**The illustrations are from the 1937 show.**

**UPPER LEFT: The Duchess of Girthrite. This wisp of feminine pulchritude with the shy coquettish smile is not a chanteuse imported from France, but is in reality Phil King (with Parker Trask in the background).**

**UPPER RIGHT: High Priest Anorthite (Lou Corrier) is explaining the operation of the "strange ellipsoid" to king Albite, (G. F. Loughlin), Prince Willemite (H. W. Patnode), Nemo, the forgotten man (E. N. Goddard), and a Mineralisian noble (G. R. Mansfield).**

**MIDDLE LEFT: A bevy of ladies in waiting of Mineralesia. They are from left to right, Ralph Cannon, who is holding hands with Patnode (these two provided the love interest in the play). Next is unknown, then Ed Eckel, and Tom Hendricks.**

**MIDDLE RIGHT: A courtier (Charlie Hunt) with beauties Ralph Cannon and Ed Eckel.**

**BOTTOM: Andy Lawson played by Jim Gilluly. Lawson showed up on the island along with the other "clown sellers" of the G. S. A.**

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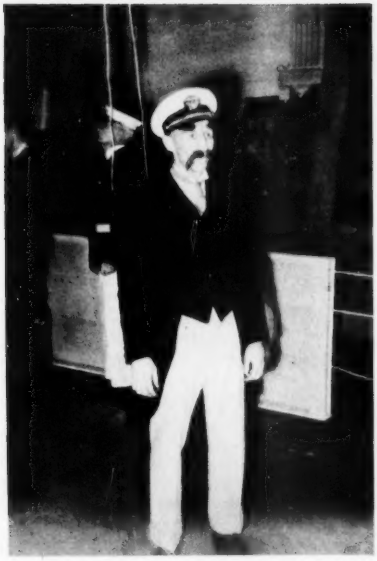
Chorus:

*Or if its mud you can stand a stick in*
*'Cordin' to Jonas it's Wissahickin*
*Dig away, dig away, dig away Dixie land*
*And other mud that's kinder thick may*
*Be the mylonite zone of Crickmay*
*Dig away, dig away, dig away Dixie land.*

Here's one the gals might find amusing. It was sung in 1952 by one of the Survey's lady geologists. "You can't get a man with a gun" from "Annie get your gun."

*When I meet a fossil*
*I warble like a throstle*

*(Continued on page 42)*



*AAPG-SEPM special . . .*

## 1960 PICK & HAMMER SHOW

**Lisner Auditorium**
**Washington, D. C.**

**April 29, 1960—8 P.M.**
***(after Atlantic City AAPG-SEPM Meeting)***

**Tickets $2.25**

Plan to attend this special performance at which the Pick and Hammer players will lampoon the big-wigs of the AAPG-SEPM.

For further information write *Pick and Hammer, 3411 Ashley Terrace, N. W., Washington 8, D. C.*

1959 eruption of Kilauea Volcano, Hawaii. View looking south from Byron Ledge, 1400 feet from base of fountain during the 6th phase of activity at 11:30 p.m., Dec. 7, 1959.

# THE 1959 ERUPTION OF KILAUEA[1]

*by*

JERRY P. EATON [2] AND
DONALD H. RICHTER [2]

"There it goes!"—"In Kilauea Iki!"—"I saw it first!"—shrilled voices in the crowd outside the Observatory as a bright orange fume cloud suddenly lit the night sky over Kilauea Iki Crater, two and one-half miles east of the U. S. Geological Survey's Hawaiian Volcano Observatory.

This was the dramatic beginning of the 1959 eruption of Kilauea, at 8:08 in the evening of November 14.

Kilauea is a broad basaltic shield volcano on the Island of Hawaii, southernmost of our newest State's island chain. The summit caldera, with its inner pit, Halemaumau, the usual site of Kilauea summit eruptions, is within the boundaries of Hawaii National Park. Kilauea Iki, or little Kilauea, scene of the 1959 eruption, is a pit crater about a mile long by half a mile wide that is separated from the main summit caldera by a low, narrow ridge (Fig. 1) called Byron Ledge.

Although the eruption appeared at the surface with electrifying suddenness, it had its real beginning quietly, months before and miles beneath the outbreak point in Kilauea Iki. The first of a network of liquid-level tiltmeter bases was installed near the Observatory in November 1957, and in the following months it indicated the ground surface at that station to be steadily inclining outward from the caldera. As we brought additional tilt bases around the caldera under measurement in the months that followed, the pattern became clearer: the whole caldera region was bulging upward and tilting outward. Analysis of tilting between October 1958 and February 1959, suggested that magma was welling up quietly from the depths and accumulating steadily in a zone several miles beneath the south rim of the caldera.

Following several moderate earthquakes just southeast of the caldera on February 19, 1959, the swelling stopped; and from May until August the summit of the Volcano subsided slowly. This we interpreted as a recession of magma in the column. Then a great swarm of earthquakes and associated tremor (over 2500 quakes and many hours of tremor) between the 14th and 19th of August originating about 35 miles beneath the north rim of Kilauea caldera were recorded by the U. S. Geological Survey's seismograph net on Hawaii. Magma moving into the deep volcanic plumbing system during this episode made itself felt at the surface shortly, for rapid swelling of Kilauea resumed between August and October (inset, Fig. 1).

In mid-September a very sensitive telerecording seismograph at the northeast edge of Halemaumau, near the center of the caldera, began recording a swarm of tiny quakes originating less than half a mile away. Although these quakes were exceedingly small, their number was impressive: over 22,000 by November 14. Except for their smaller size, these quakes closely resembled those preceding the 1955 eruption of Kilauea from its east rift zone. As the number of these quakes increased, scientific and public interest began to

[1] Publication authorized by the Director, U. S. Geological Survey.

[2] U. S. Geological Survey, Hawaiian Volcano Observatory, Hawaii National Park, Hawaii.

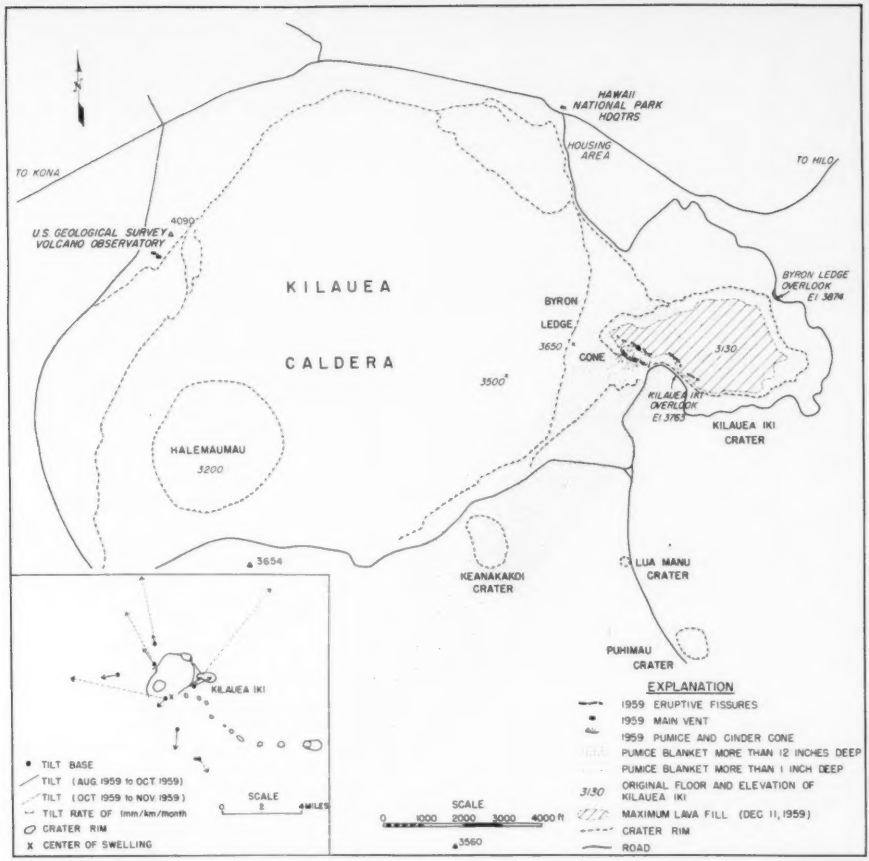



**Figure 1.** Map of Kilauea caldera and vicinity showing principal features of the 1959 eruption in Kilauea Iki crater. Small scale inset map shows tilt pattern on the summit of Kilauea prior to the eruption.

mount. Uncertain of the significance of these tiny shallow quakes, we began a hurried remeasurement of tilt-base changes in early November. Dramatic changes had occurred: the caldera region was swelling at a rate at least three times faster than had been detected before (inset, Fig. 1). On the evening of November 14 as the Observatory staff readied its special eruption equipment "just in case" and as an excited crowd of "seismograph watchers" grew outside the Observatory window, the tiltmeter crew started off to remeasure the last two tilt bases; but the eruption broke out before the crew got to work.

Minutes after the first glow was sighted, we were standing on the rim of Kilauea Iki with one of nature's most fantastic displays unrolling before us. Starting in a

**Figure 2.** The "curtain of fire" from Byron Ledge overlook at 10:00 p.m., Nov. 14, 1959, two hours after eruption began. Floor of crater, 744 feet below overlook, is not yet covered by the rapidly flowing lava.

single fissure half way up to the 600 foot south wall of the crater, fountaining rapidly spread laterally in both directions. By 10:00 P.M. ten short fissures, each with one or more active lava fountains, formed a discontinuous "curtain of fire" 0.5 mile long (Fig. 2). A few minutes after this maximum lateral development, the fountaining at the ends of the line of fissures began to abate. Gradually activity ceased in the outermost vents and by 4:00 A.M. only two fountains remained. One of these continued through the early afternoon of November 15, when it too, died: the other grew in size, eventually reaching the unprecedented height of 1900 feet on December 17 during the 15th phase of the eruption.

During the first night and early morning we began to suspect, as the line of fountains shrank, that the eruption might be over by dawn. Spurred on by the possibility of a short-lived eruption, Jack Murata, Scientist In Charge of the Volcano Observatory, and Wayne Ault, geochemist, were anxious to start collecting gas and lava samples. The best sampling area appeared to be at the base of the largest fountain, where small lava flows occasionally branched off the main stream and covered a few hundred square feet before solidifying. Clad in asbestos protective gear we descended into the crater and walked over still warm flows and vents that had died only a few hours earlier. We got within 200 feet of the base of the fountain. At the time, however, it seemed more like 50 feet than 200, but with brilliant orange-yellow spatter being tossed into the air above our heads, horizontal distances were foreshortened drastically. With the first 1959 samples collected, we hastily retreated to the crater wall to a firmer and much cooler vantage point above the fountain. Little did we realize that Sunday morning, while working below the fountain, that only two weeks later the area where we stood would be under 100 feet of lava and have a 1000 foot fountain playing above it (Fig. 3).

Fortunately for our scientific studies, the eruption continued, the first phase lasting ½ hour short of a week. Throughout the eruption every possible phase of the volcano is being studied. Pumice samples, many still incandescent, are gathered at least twice daily; pond samples, dipped from flowing pahoehoe lava when conditions permit, are taken daily; and gas samples are collected whenever time and apparatus become available, from vents, flows and even by planes flying through the fume cloud. As we are writing this Ault is attempting to rig a cable across the vent in hopes of catching gas being emitted during the early stages of an eruptive phase.

**EDITOR'S NOTE:** *The scientific staff of the U. S. Geological Survey in Hawaiian Volcano Observatory consists of two geochemists (Jack Murata and Wayne Ault), two geophysicists (Jerry Eaton and Harold Krivoy), and two geologists (Chester Wentworth and Don Richter), who are members of the Geochemistry and Petrology Branch. The editor is grateful to Bill Pecora, Chief of that Branch, for arranging to obtain this timely and personalized account of the eruption. When Bill and I were reviewing the manuscript, we were startled with the calculation that the volume of erupted material since November 1959 would more than suffice for paving a continuous 4-lane super highway connecting the major cities of Boston, Seattle, Los Angeles, and New York. GeoTimes is very pleased to offer this spectacular on-the-ground account showing geology—and geologists—at work!*

Besides the sampling for chemical and petrological study, numerous other equally important investigations are underway. Pyrometric measurements are taken frequently during the eruptive phases. A portable seismograph has been put to work in an attempt to follow the movement of magma undeground. Valuable sub-surface data are being obtained by Harold Krivoy, geophysicist, with a gravimeter sent by air from our Geophysics Branch on the mainland. During the earlier phases of activity Krivoy also employed a portable tape recorder to record, for study and informative purposes, some of the indescribable sounds produced by the large fountain and its attendant pumice and spatter shower. There is no question that this will be one of the most intensively studied of all Hawaiian volcanic eruptions.

Personnel of the National Park Service have assisted the Geological Survey investigators in many ways. All measurements of the height of the lava fountain have been made by Park naturalists. The Service has also established radio communication between the Observatory and Byron Ledge overlook which permits ready correlation of seismic activity with eruptive activity at the vent.

From the scientific point of view, we have been very fortunate to have the

**Figure 3.** (above) 1000-foot fountain during 3rd eruptive phase, as seen from Kilauea Iki overlook 900 feet east. Road is covered by spatter from earlier eruptive phase.

**Figure 4.** (top right) View of eruption from the northwest rim of Kilauea caldera with the U.S.G.S. Volcano Observatory in the foreground. Photo taken Dec. 14th 1959 during the 10th eruptive phase. Fountain height is approximately 800 feet.

**Figure 5.** (upper middle right) Survey Geophysicist H. L. Krivoy inspects a shelter in a Hawaii National Park campground, 3500 feet southwest of fountain, covered by 4 feet of basaltic pumice. Photo taken Dec. 15, 1959 at close of 11th eruptive phase. Note denuded ohia forest.

**Figure 6.** (lower middle right) View looking west from Byron Ledge overlook, during the early morning of Dec. 5, 1959 (4th phase), showing fountain, cone, and incandescent glow through the cracks in the crust of the lava pond. Pond at this time was 395 feet deep.

**Figure 7.** (bottom right) Lava pond at extreme east end of Kilauea Iki showing collapse of central portion of pond due to withdrawal of fluid lava following the 11th eruptive phase (Dec. 15, 1959).

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eruption confined to a pit crater practically in our own backyard (Fig. 4). Not only has it allowed easy access for sampling and observation, but we have also been able to calculate rather precisely the volume and rate of lava extrusion and withdrawal much the same as in a graduated cylinder. From the human viewpoint however we have mixed feelings with regard to the proximity of the eruption. Throughout the course of the eruption the fountain has been very unpredictable, sometimes low and bubbling, but more

*(Continued on page 45)*

## CONGRESS corner

news and information on the

INTERNATIONAL GEOLOGICAL CONGRESS NORDEN

August 15-25 1960

The Second General Meeting of the International Mineralogical Association will be held in the Mineralogical Museum of the University of Copenhagen in Denmark between August 18 and 25, 1960. Besides the business meetings of the delegates and the meetings of the existing commission, there will be two symposia: 1) Mineral synthesis (including high-pressure work), and 2) Feldspars (in all their aspects). Those planning to attend should write Dr. J. L. Amoros, Museo de Ciencias Naturales, Paseo de la Castellana 84, Madrid, Spain at once; if giving a paper in either symposium, submit a title. Those not registered with the International Geological Congress should send $10 to Dr. Hans Clausen, Mineralogisk Museum, Oster Volgade 7, Copenhagen K, Denmark, at once and give dates, kind of room (A best, B, C, or private lodging), one or two beds, etc.

The Third Circular will be mailed by the Organizing Committee to all persons who have registered. Persons who have not previously registered may request the circular by writing *AGI Congress Service, American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D.C.*

Tourist literature of Denmark will not tell you that probably the first scientific research institute was established in Denmark. Tycho Brahe (1546-1600), the famous Danish astronomer was endowed by King Frederick II with liberal funds to pursue pure science. Brahe was granted the island of Hven in the sound just outside Elsinore. He was also given funds to build Uraniborg, the Castle of Astronomy, and to support the investigations of himself and his assistants. The castle was started in 1576 and completed in 1580. The scientific activity flourished until 1597 when Brahe fell from grace and moved to Prague. Today only traces of the foundations of Uraniborg remain for it was destroyed shortly after Brahe abandoned it. In the Art Gallery, Frederiksborg Castle there is a fine painting of this first research institute.

## MANPOWER *in a column —*

By HOWARD A. MEYERHOFF

*Scientific Manpower Commission*
*1507 M Street, N.W., Washington 5, D. C.*

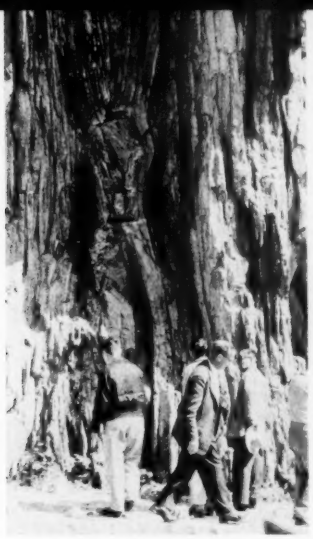
It took five years from the outbreak of the war in Korea to convince Congress that some scientists and engineers of military age can render more important service to the nation out of uniform than in it. It was 1955 when Congress empowered the President to create a Critical Skills Program wherein those eligible to enter it could complete their military obligation in 3 to 6 months. The President exercised this power early in 1956.

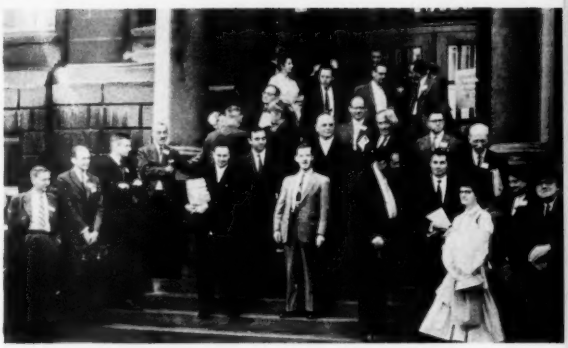
Now the Department of Defense proposes to scrap the program, which is the only route available to essential young men who wish to fulfill their military obligation but who are needed urgently in activities essential to the national defense and welfare.

The chief reason advanced in defense of the proposal is economy. Administration of the program costs $1,500,000. It doesn't take a slide rule to figure that, as a ratio to the entire military budget, this item of cost gets lost at some distance to the right of the decimal point. Defense also claims, with more justice, that men with only 3 months' training and standby reserve status thereafter are of little use to the military establishment. As an alternative to training, Defense officials propose that the Selective Service System place men qualified for the Critical Skills Program in the lowest category of call for induction—much like fathers under present regulations.

The Scientific Manpower Commission has urged the Congress—unsuccessfully—to amend the Draft Act or the Reserve Act so that men with critical occupations may meet their obligation by serving as civilians in essential activities for periods as long as the reserve obligation in the military. For political reasons, the Congress is not yet ready to accept civilian service as a substitute for military service. As long as this is the situation, it behooves the Department of Defense to observe the spirit of the law and to forego any attempt to shift a responsibility of this kind to the Selective Service System.

Until Congress can be persuaded to amend existing laws, SMC will back Selective service officials in their opposition to Defense's proposal. We suspect there are other—and legal—ways by which Defense could save $1,500,000. As taxpayers, we would like to see it tried.





# First Congress of the INTERNATIONAL MINERALOGICAL ASSOCIATION

a report by
D. Jerome Fisher
University of Chicago

The IMA held its first congress at the Federal Institute of Technology in Zürich, August 29-September 3, 1959; this was followed by two concurrent field trips in the Alps from September 4-7. The names of the officers and councilors of this association, together with its early history and first constitution, were given in GeoTimes for September, 1958. The Zürich meeting was attended by about 100 professional mineralogists, petrologists, crystallographers, and geochemists. This included everyone of its officers and councilors, and all but two or three of the chairmen and secretaries of its four commissions. The United States was well represented by Buerger, Donnay, Faust, Fisher, Frondel, Holser, Hooker, Ingerson, Switzer, and Winchell. Delegations were also present from Canada, India, Japan, and 16 European countries, including the U.S.S.R., which has the largest mineralogical society in the world. In addition, applications to join the IMA were received from Egypt and New Zealand. At the business meetings a greatly revised constitution was adopted, and it was voted to hold the next meeting at Copenhagen with the International Geological Congress next August.

**Upper Left:** Members of the east group studying incipient boudins and mineral nests in the rocks along the south edge of the Aar Massiv at Urnerloch, near Goschenen.

**Upper Right:** Mineralogical Institute, Federal Institute of Technology, Zurich, where the first congress of the International Mineralogical Association met.

**Lower Right:** Some of the participants of the IMA Congress are photographed on the steps of the Zurich Mineralogical Institute.

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The members of the IMA are not individuals, but the various National Mineralogical Societies, or similar less-formal groups of interested scientists in those countries which lack a national society; no country can be represented by more than one society. The major efforts of the IMA are centered in (1) the work of its four commissions (two more may be added at Copenhagen) composed of one representative from each society, and (2) the provision for scientific meetings (and field trips) of mineralogists, etc., mostly in connection with other international meet-

*(Continued on page 44)*

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[1]Special project funds derived primarily from grants received for education programs, translations, abstracts and the National Register are not included. These funds are ear-marked and cannot be applied to general operations and GeoTimes.

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# MISSION 66 GEOLOGY LIAISON of AGI IN ACTION

**Richard L. Threet,** Univ. of Utah (second from left) at resquest of AGI Mission 66 Committee reviews plans for geologic interpretation at Rainbow Point, Bryce Canyon National Park with NPS officials, and Park Service geologist John Good at left.

Geological features of several National Park Service areas will soon receive better interpretation through the help of AGI's MISSION 66 Committee and the geological profession. Since the first project in July, 1958 *(GeoTimes, September, 1958),* professional geologists have contributed their knowledge and time to improve geological interpretation in Yosemite National Park, Death Valley, Joshua Tree, White Sands, and Tonto National Monuments.

The MISSION 66 Committee tries to work with groups to obtain help for geological interpretation but may not always do so. For example, Mr. Robert Raup, Jr., of the U.S. Geological Survey spent a day last September in Tonto National Monument with Superintendent Wiffler Oaks pointing out interesting geological features in the area.

Charles B. Hunt, also with the Geological Survey, has helped the Park Service tremendously in preparation of museum plans for Death Valley. Through days spent with exhibit planners and his intimate knowledge of the area, Mr. Hunt has focused attention on geological phenomena that would otherwise have been neglected.

Last spring Dr. Frank E. Kottlowski and three other geologists joined Park Service officials at White Sands National Monument to facilitate interpretation of the gypsum dunes and alkali flats found there. This profitable conference was made possible by Dr. Frederick J. Kuellmer, New Mexico Bureau of Mines and Mineral Resources, in response to a MISSION 66 Committee request.

**Charles B. Hunt,** former executive director of AGI is shown here on a salt pan in Death Valley, California. Hunt, of the U. S. Geological Survey, has aided the Park Service in museum planning at Death Valley.

A similar request to the Peninsula Geological Society brought Drs. Howel Williams and Arthur Howard to Yosemite for three days last August. They reviewed exhibits in the museum and concentrated on roadside geological interpretive planning with excellent results. Their observations and comments are proving most helpful to exhibit planners and interpreters working in the Park.

Last April, Dr. Ian Campbell, Chief, California Division of Mines, arranged to have Cliffton Gray meet Park Service officials at Joshua Tree National Monument to discuss its geology. Dr. Gray arranged future meetings with the park naturalist to clarify any aspects of local geology as may be necessary.

None of these projects is a major achievement in itself. The MISSION 66 Commit-

## Gillson Takes Office as AIME President

Dr. Joseph L. Gillson, Chief Geologist of the E. I. duPont de Nemours & Co., Wilmington, Delaware takes office as President of the American Institute of Mining, Metallurgical, and Petroleum Engineers at the annual meeting of the Institute in New York, February 14-18. Dr. Gillson's election as President climaxes his service to AIME in many varied capacities over the years. He is editor of the new third edition of "Industrial Minerals and Rocks." In 1957 he received the coveted Jackling Award.

Dr. Gillson is a past president of AGI and is immediate past president of the Society of Economic Geologists.

## World Survey of Indian Ocean

The United States will be one of a number of nations participating in the International Indian Ocean Expedition which involves 15 or more oceanographic research vessels in a concentrated study of physical and chemical oceanography, submarine geology, geophysics, meteorology, and marine biology of the little-known Indian Ocean mainly in the period 1962-1963. Plans for the program by the participating nations which include the U.S. and the U.S.S.R. are being developed by the participating countries. Robert G. Snider has been appointed coordinator of U.S. and international activities in connection with the program as an executive secretary of the Committee on Oceanography, NAS-NRC. He will maintain offices at 30 E. 40th St., New York, N. Y.

tee believes, however, that taken as a group, these projects represent a significant advance in helping the public develop interest and understanding of geology.

Certainly, geology in our national parks is outstanding. If the geological profession continues to respond to committee requests as well as societies and individuals have thus far, we may be confident that geological interpretation to more than 60 million park visitors will be greatly improved.

**NORTHWEST METALS AND MINERALS CONFERENCE, APRIL 28-30**

Hollis M. Dole (right), Oregon State Geologist, discusses plans for the 13th Annual Pacific Northwest Metals and Minerals Conference of the AIME with John R. Anderson (left), product engineer, Carborundum Company, Vancouver, Washington. Dr. Dole is general chairman for the meeting to be held in Portland, Oregon, April 28, 29 and 30 and Mr.. Anderson is co-chairman. The program will include field trips and papers on mining, metallurgy, petroleum, industrial minerals and geology.

## Wisconsin Graduate Research Aid

The Wisconsin Alumni Research Foundation has announced that applications will be received up to February 16, 1960 for its fellowships to support graduate research. Candidates are to be nominated by faculty members who must take the initiative in making nominations. Application forms for nominations of students wishing to study geology may be requested from the *Department of Geology, University of Wisconsin, Madison, Wisconsin.*

## Research Project at Brown

A three-year program of research on the petrologic and geochemical problems is being undertaken by the department of geology at Brown University aided by a $100,000 grant from the National Science Foundation.

Funds will support both research and laboratory studies on rocks of the Appalachian Mountains in New England areas and will provide for a gas mass spectrometer to permit potassium-argon age determinations.

The project will be headed by Dr. Bruno J. Giletti, geochemist, coming to Brown from Oxford University, England in 1960, Dr. Frank D. Eckelmann and Professor Alonzo W. Quinn, chairman of the geology department.

# TRAVELING SCIENTIST[1] PROGRAM IN KANSAS

Dr. Ada Swineford, traveling scientist, turns the pages of a preliminary copy of **Geology and Related Sciences Sourcebook** prepared under the direction of the American Geological Institute, as Mr. Allison Hornbaker, traveling scientist, explains some of its features to Mr. Warren Bell (standing), science consultant, and Dr. George Cleland, director of the Division of Instructional Services, Kansas State Department of Public Instruction.

Many science teachers in Kansas high schools are becoming aware of geology and its possibilities in their science courses through a traveling scientist program sponsored by the Kansas Junior Academy of Science–National Science Foundation.

Under the program, four traveling college scientists–two geologists, one biologist, and one chemist-physicist–are spending in total time six days a week during the 1959-1960 academic year visiting high school science departments in all regions of the state. The four scientists fill three 0.4 time positions supported by NSF funds. The geologists, Dr. Ada Swineford and Mr. Allison Hornbaker of the State Geological Survey at The University of Kansas, share a position; the chemist, Mr. Elton Cline of Kansas State College of Pittsburg, and the biologist, Mr. Ward Sims of Fort Hays Kansas State College at Hays, are responsible for one position each.

The objective of the program is to improve science teaching in Kansas secondary schools, according to Miss Margaret Parker, physics professor at Kansas State College of Pittsburg and, as chairman of the Kansas Junior Academy of Science, director of the program. Through exchange of information among the traveling scientists, geology is getting its share of consideration as a unit in general science courses, as a subject with applications in biology, chemistry, and physics courses, and in some schools as a separate course.

That two of the traveling scientists are geologists does not necessarily mean, however, that geology is being stressed at the expense of other sciences. It does, on the other hand, speak well for the geology profession that the geologists qualify by experience and interest to offer assistance in the field of high school science. It indicates further that geology is becoming more generally recognized as a science to share with the public.

Diversification of scientific interest, training, and geographic distribution over the state were factors considered in the selection of the traveling scientists. Selection was made by Dr. T. M. Sperry, chairman of the Department of Botany at Kansas State College of Pittsburg and president of the Kansas Academy of Science; Dr. T. F. Andrews, chairman of the Department of Biology at Kansas State Teachers College at Emporia and past president of K.A.S.; and Miss Parker, chairman of the Junior Academy of Science. The K.A.S. Council approved the selection. Each of the scientists chosen is responsible for an area of the state assigned by Miss Parker. The geologists, who are located in Lawrence, visit high schools in northeastern and north-central Kansas; the chemist, who lives at Pittsburg, has southeastern Kansas; and the biologist, whose home is Hays, makes contacts in western Kansas.

Kansas has approximately 600 high schools. Obviously all schools cannot be visited this year by four traveling scientists. How then are schools selected? Miss Parker this fall wrote letters to science teachers and principals or superintendents in all Kansas high schools to explain the program and to ask those interested to return a prepared form, signed by both science teacher and principal (or superintendent). Miss Parker forwards the forms, as received, to the traveling scientists responsible for the areas in which the high schools are located. The traveling scientists contact the science teachers requesting visits to arrange a time for visiting. To date, requests have been received from approximately 200 schools; science depart-

*(Continued on page 52)*

[1] A report by Grace Muilenburg, Public Information Director of the State Geological Survey of Kansas.

## Popular Geology in Print

by Mark W. Pangborn, Jr.

Scientists and science-minded high school students and laymen will be utterly fascinated by ADVENTURES WITH THE MISSING LINK (Harper, 1959, $5), *Raymond A. Dart's* revealing story of his life and discoveries. Dart, an M.D. and anatomist, began searching South African Pleistocene deposits in 1924, and, with Robert Broom, amassed a wonderful collection of bones and tools of Australopithecus, our unsavory ancestor of half a million years back. This choice book includes a variety of fine illustrations and a bibliography.

Dart's once scorned man-apes march through the pages of anthropologist *William White Howells'* splendid MANKIND IN THE MAKING (Doubleday, 1959, $4.95). Replacing his own "Mankind so far," which in turn was based on Hooton's "Up from the ape," this story of human evolution will delight both layman and scholar as Howells traces man's physical development from primitive mammal to the several races of today. There is a glossary and an abundance of beautiful and pertinent illustrations, maps, and diagrams; the only fault we can find with this superbly written book is the absence of a bibliography.

For the same audience is NO STONE UNTUBNED (Random House, 1959, $5), in which amateur archaeologist *Louis A. Brennan* attempts to summarize some 40,000 years of man's history in North America. Unfortunately Brennan is no Howells, and the remarkable story that Carbon 14 and recent excavations are revealing emerges encrusted with extraneous material and would-be wit.

Just the thing for ages 10 to 14 is *Sam* and *Beryl Epstein's* ALL ABOUT PREHISTORIC CAVE MEN (Random House, 1959, $1.95). Peking, Neanderthal, and Cro-Magnon men are each discussed, with accounts of how the scientists dsicovered and studied the remains; there are also chapters on stone tools and on European cave art. Pictures are adequate and more to the point than those in some volumes of the otherwise fine "Allabout" series.

Equally good is *William E. Scheele's* THE CAVE HUNTERS (World, 1959, $2.50); aimed at ages 8 to 12, it portrays the everyday lives of two tribes, one Neanderthal and one Cro-Magnon, competing for caves and game, and features the eventual triumph of the more advanced race; pictures are numerous, interesting, and dramatic.

ADVENTURE IS UNDERGROUND (Harper, 1959, $4.50) is *William R. Halliday's* very informal summary of the major caves of western United States and an account of how he explored many of them. Includes a list of Western commercial caves and a chapter on how to spelunk in the West; illustrations and maps adequate, but no bibliography.

## NSF Grant for Paleontology

The National Science Foundation has just notified the University of Kansas that approval of a grant amounting to $210,000 has been made for an accelerated program of work to complete the *Treatise on Invertebrate Paleontology*. This is a 22-volume work sponsored by the Geological Society of America, the Paleontological Society, the Society of Economic Paleontologists and Mineralogists, and the Palaeontographical Society (Great Britain) and directed by Raymond C. Moore. Contributing authors are about 160 specialists distributed in 20 countries.

Expenditures under this grant, which is for the 5-year period of 1960-64, are mostly authorized for research assistance in institutions throughout the world wherever needed.

## Geoscientists Receive Antarctic Grants

Four geoscientists recently received research grants from the National Science Foundation to support Anarctic research and associated activities. The principal research workers and their institutions are as follows: George P. Woollard, University of Wisconsin; James H. Zumberge, University of Michigan; E. J. Zeller, University of Kansas and H. J. Manger of the Snow, Ice & Permafrost Research Establishment, Wilmette, Illinois.

## New Oceanographic Vessel

The Woods Hole Oceanographic Institution was recently granted $3,000,000 by the National Science Foundation to build a new oceanographic vessel to replace the R/V Atlantis, 28-year old "flagship" of the Woods Hole fleet. The vessel will be 175 feet in length and will involve new, distinctive design particularly adapted to oceanographic research functions.

# Nomenclature of Migmatitic and Associated Rocks[1]

*by* RICHARD V. DIETRICK[2]

Many of the geologists who will visit Scandinavia this summer will be especially interested in seeing the migmatites and associated rocks there. Many ideas concerning these rocks and also much of the pertinent nomenclature of petrology have had their birth and/or major development based on investigations there.

During the 1958-59 academic year I was fortunate enough to be able to visit numerous "migmatite . . . *etc.*" localities in Finland, Norway, and Sweden in the company of Scandinavian geologists. One thing we found out on each excursion was that many of our "disagreements" were but misunderstandings based on lack of knowledge of each other's nomenclature usage. Much to our surprise, this was true even between those of us who were quite familiar with each other's publications.

In view of this and because I believed such might lead to unnecessary haggling and loss of valuable time on excursions to be held in conjunction with the 21st International Geological Congress, I made the suggestion to Professor Tom. F. W. Barth and J. A. Dons, two members of the Organizing Committee of the Congress, that it would be advantageous to prepare and make available a glossary to show how the most frequently used terms are currently used by the excursion leaders. In turn, they suggested that, because I had recently visited several localities in three of the countries and had already recognized some of the possible difficulties, it would be appreciated if I would compile such a list of definitions and submit the results to the American Geological Institute for pre-Congress publication in *GeoTimes*.

Subsequently, the geologists involved were sent mimeographed sheets which included: 1) a list of terms, 2) definitions as given in the *"Glossary of Geology and Related Sciences"* (Am. Geol. Inst., 1957) for most of those terms included in that volume, 3) my choice of definitions for those terms not included in that volume, 4) remarks concerning certain aspects of some of the definitions, and 5) a group of schematic diagrams of field exposures of some of the rock types and relationships similar to those that will be seen at various places during the Congress excursions. Their comments were requested (in light of the above stated objective). Many, although not all, responded. ("Finns," "Danes," "Norwegians," and "Swedes" in the following refer to only those geologists who did respond.) The following is a slightly generalized compilation of the returns.

AGMATITE—any visibly (megascopically and apparent in exposures measurable in a few square meters) composite rock that consists of rock fragments surrounded by granitic rock. — This is a nongenetic field designation which can be used for such diverse things as injection breccias, rheomorphic breccias, and replacement breccias. (Some Swedes restrict the definition by requiring the granitic portion to be palingenic; Norwegians want the fragments to be angular or irregular.)

ANATEXIS—melting of preëxisting rock to form magma. — Partial melting of this type would be the partial or differential anatexis of some workers. (The Danes and some Norwegians believe that anatexis must be a high-temperature "regional" metamorphic process which occurred in the deep levels of the crust; the Danes prefer not to call the material so formed magma.)

ARTERITE—a migmatite, commonly with the appearance of a veined or banded gneiss, into which the so called vein material was injected as a magma. — This is the same as the arteritic gneiss, injection gneiss, and lit pa: lit gneiss of some workers. (The Danes prefer merely to derive the so called vein material from the outside without requiring that it be injected magma.)

BANDED GNEISS—a regular layered metamorphic or composite rock the layering of which is dependent upon the alternation of layers the compositions and/or textures of which differ markedly from those of adjacent layers and with the thicknesses of individual layers generally

[1] ACKNOWLEDGEMENTS—To Tom. F. W. Barth and J. A. Dons who discussed some of the problems involved and aided in the reproduction of the questionnaire, preparation of the diagrams, and distribution of the form; to the National Committee members who arranged for distribution of the form among their interested colleagues; and, to the Scandinavian petrologists who responded to the questionnaire I express my grateful thanks!

[2] DR. DIETRICH is a professor in the Department of Geological Sciences, Virginia Polytechnic Institute, Blacksburg, Virginia. He initiated this compilation last spring while he was a Fulbright Senior Research Scholar at the Mineralogisk-Geologisk Museum, Oslo, Norway.

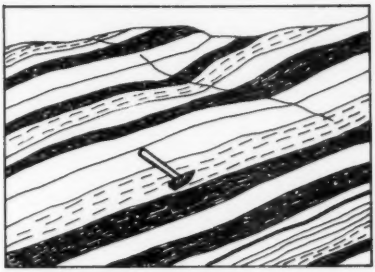

FIGURE 1a: Banded Gneiss

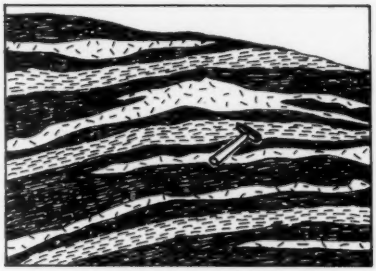

FIGURE 1b: Veined Gneiss

**The "bands" of a "banded gneiss" should be rather uniform in thickness over distances measurable in meters in contrast to the "veins" of a "veined gneiss" which are typically irregular and can not be traced over appreciable distances. These relationships are analogous to twin lamellae of plagioclase feldspars versus the arrangements between plagioclase and K-feldspar components in string and film perthites. In each figure: the materials indicated by the directional patterns are foliated metamorphic rocks, e.g., amphibole-rich gneiss; those indicated by the non-directional patterns are granitic in composition; in figure 1a, the blank areas represent diverse quartz-rich foliated rocks.**

measurable in not more than a few meters (see Fig. 1a).–The Danes and some Norwegians prefer to put a minimum limit of 1 cm. on the thickness of individual bands; if most bands are less than 1 cm. thick, the Danes use the designation "striped gneiss"; they use "giant-banded gneiss" where the bands are more than 50 cm. thick.)

BASIC FRONT – in granitization, an advancing zone enriched in calcium, magnesium, and iron, which is said to represent those elements in the sediments being granitized, over and above those necessary to form granite; during the granitization process these are displaced and move through the rock ahead of the granitization front, usually as a zone enriched in mafic minerals. (This term is used by only a few of the geologists polled. Most doubt that basic fronts exist although all believe that residual basified zones–"basic behinds"–do exist. All admit that it would be difficult to distinguish between these, if both do exist. The term *zone of metamorphic enrichment of basic components* was suggested as a good non-genetic, descriptive designation for all such zones.)

COMPOSITE GNEISS–any gneiss which at one time was constituted by at least two phase-wise different materials.–This would include venites, arterites, and ectectites.

DIKE–(*comment only* – a few Scandinavian geologists use the term dike to designate both dikes and steeply dipping sills.)

ECTECTITE–a migmatite, commonly with the appearance of a veined or banded gneiss, the magmatic portion of which was developed either by magmatic exudation or by essentially in situ anatexis.–This appears to be necessary to complete the group which also includes arterite and venite. (*Anatexite* is a synonym–possibly it is preferable.)

GNEISS–a roughly or poorly foliated or banded metamorphic rock. (There is much disagreement concerning this term. Some call igneous rocks with primary foliation gneisses; others delimit these. Some require a granitic composition unless the term is modified so as to indicate otherwise. Most use modifying terminology which is clarifying.)

GRANITE–a phanerocrystalline rock that consists essentially of alkalic feldspar and quartz. Sodic plagioclase, typically oligoclase, is commonly present in small amounts. Muscovite and the mafic constituents, biotite, hornblende, or rarely pyroxene, also may be present. (The Finns and some of the Norwegians prefer to add "plutonic" to the definition; many also prefer to include a statement concerning feldspar percentages, *e.g.*, Or>Ab+An.)

GRANITIZATION–any process or group of processes involving entry and exit of material and by which solid rock is converted (or transformed) *in situ* to a granitic rock without passing through a magmatic stage. (The Finns prefer to eliminate "without passing through a magmatic stage.")

IGNEOUS (adj.)–formed by solidification from a magma.

MAGMA–naturally occurring mobile rock material, generated within the earth and capable of intrusion and extrusion, from

*(Continued on page 50)*

# DEPLETION

by THOMAS C. HIESTAND [1]

On November 16th the Ways and Means Committee of U. S. House of Representatives in Washington opened hearings on tax matters including tax on oil and gas sold from a producing lease property. A news writer reports that two men, William F. Hellmuth, Jr., of Oberlin College and Joseph W. Pechman, economist for National Association of Manufacturers, are charging that Government is being deprived of tax revenues amounting to five billion dollars this year by reason of legal deductions including depletion and development cost of the producing leases before operators have computed taxable income.

It is time that geologists and landmen, engineers, accountants and attorneys wake up to the powerfulness of adversaries who advocate liquidation of Capital Assets in guise of taxable income. We know, if and when Management is short of Capital for exploration the geologist and landman are first in line to be liquidated.

A recent 15,000-air mile lecture tour of the United States and Canada to speak before 25 local geological societies and 10 universities on the subject of Depletion of Producing Lease Properties and Economics of Producing Oil and Gas from the Standpoint of the Geologist has made apparent that many persons in the industry do not grasp the fact that Depletion is a reduction in Capital Assets equal to the value of the oil and gas at the reservoir level in the lease property. Competent authorities among attorneys, accountants, geologists, engineers and operators, can express what the value is in terms of stock tank barrels and cubic feet of gas at orifice meter when sold into the pipeline. Actually there is a considerable range in value due to economic conditions peculiar to each producing lease property, such as its geographic location relative to supply and demand within the region and the gravity of the crude sold from each property. We know that according to gravity schedule price of crude in the United States ranges from $1.76 to $3.05 per barrel. And we know that the crude at the reservoir level sells for 60 cents to $1.50 per barrel when title to a lease property changes in ownership. In this comparison of value of reservoir oil and gas to the price of oil and gas sold into the pipeline it is apparent the ratio is 1:3 or as much as 1:2; expressed in percentage we would figure 33⅓ to 50 percent, and this is what the accountant does in keeping books on producing leases.

The Supreme Court in 1917 (274 U.S. 295, 47 S. Ct. 608) decided that the oil and gas in a producing lease at the reservoir level are Capital Assets. Therefore depletion is a Capital Loss to the producer, both the Working Interest and Royalty Interest owners. However, in 1926 the Act on income tax and capital gain and loss scehdule was amended with provisions that producers could classify as Capital Loss whichever is lesser, either 27.5 percent of the total sales receipts for oil and gas sold from a lease property during a taxable year, or 50 percent of net amount computed by difference taken between the total sales receipts and total cost of operating the lease property during the taxable year. As geologists we should determine whether the provisions are true in properly classifying the Capital Loss due to depletion of the producing lease property.

In 1955 the U.S. Bureau of Mines reports that total domestic crude in the United States sold at average price of $2.77 per barrel. According to the value of crude at the reservoir level we found as aforementioned an amount of not less than 33⅓ per cent, in 1955 equal to 92.3 cents per barrel. However, the Bureau found Working Interest owners' 50 per cent of net per property was equal to 63.7 cents per barrel which they had to use as Capital Loss because it was less than 27.5 percent of total sales receipts equalling 76 cents per barrel sold. Evidently the Working Interest owner was shorted an amount equal to 28.6 cents per barrel. The Bureau reports Working Interest owners total sales in 1955 amounted to $6,720,-799,000; the total shortage in Capital Loss suffered by the owners in 1955 was approximately $694,455,690. This error in properly classifying Capital Loss for producing lease properties has been in existence since 1926. At that time daily domestic production was approximately 2 million barrels and today it is almost 7 million barrels, consequently the error is magnified 3½ times in the 33 year period.

The Royalty Interest owner has no operating cost on his producing lease property so his 50 percent of net amount equals $1.385 cents per barrel for 1955 and 27.5 percent of total sales equals 76 cents which he uses as his Capital Loss. However, he suffers a shortage also (92.3-76) of 16.3

*(Continued on page 45)*

[1] THOMAS C. HIESTAND, Denver consulting geologist, recently toured 25 local geological societies and 10 universities under auspices of the AAPG Distinguished Lecture Tour lecturing on "A Geologist Discusses Depletion". Because of the timeliness of this topic, a summary by Mr. Hiestand is presented in GeoTimes.

## GEOLOGY IN FINLAND

*(Continued from page 9)*

was called by him the Bothnian formation and interpreted as deposited on a granite exposed south of the zone and called by him the Prebothnian granite. North of the Bothnian zone widely distributed granites of the Central-Finnish massif were found to be intrusive in the Bothnian: the Postbothnian granites. In 1914 E. Mäkinen found that the situation at the southern contact is the same and that all the granites around the well preserved zone are Postbothnian. In some places, at Lavia and Suodenniemi, Sederholm had described quartz diorities which he still regarded as Prebothnian. This evoked an animated discussion with Mäkinen. That time it ended unsettled. Fifteen years later Sederholm found additional evidence for a sub-Bothnian unconformity in the form of breccias formed by secular weathering of the quartz diorites and overlain by the Bothnian sediments. Feeling that even this was not as conclusive evidence of an unconformity as would be an unquestionable basal conglomerate, Sederholm continued his search and believed to have found some, e.g. on a small island Bockholm in Enklinge, Aland archipelago. Some geologists who had visited this occurrence were in doubt, however, as to whether it was at all a conglomerate and not a tectonic breccia. Some other evidences of a sub-Bothnian unconformity have after Sederholm's times been presented by others, but none of them seems to be quite conclusive, although everybody must admit that a sediment must at least once have had a bottom. As Sederholm used to say: "I ask, where is the bottom, as pertinaciously as the Frenchman asks Où est la femme!"

The schists south of the Bothnian belt are migmatic or at least strongly metamorphic. They were called Svionian by Sederholm and interpreted as Prebothnian in age. Newer investigations, as reported by A. Simonen, have established, however, that the Bothnian sediments which have so astonishingly escaped metamorphism and intrusion of granite, towards the south pass over into the Svionian schists without any unconformity. Sederholm apparently never could get rid of the belief that strong metamorphism is a sign of old age of rocks. The whole southern Finland, as well as most other parts of the country, are of the Svionian type, and in different areas there may exist rocks of very different ages, but, to be sure, their ages cannot be read from their grade of metamorphism. The almandine-cordierite gneisses or kinzigites, widely distributed in South Finland, are chemically like the Bothnian varved pelites and locally show varve structure. They may well be of the same age.

The Swedish leptites have been regarded as typical Svionian rocks, mostly of volcanic origin. The rocks called leptites in Finland were recently shown by H. Tuominen and T. Mikkola to be to a great part of sedimentary origin like the kinzigites. H. Väyrynen has proposed for this type of rocks the name Fennonian.

In eastern Finland Sederholm separated, according to the grade of metamorphism, a series of clastic quartzites, dolomites, and pelites as a younger, Jatulian, and strongly metamorphic schists as an older, Lagodian formation. In 1902 B. Frosterus in Finnish and Ramsay in Russian Karelia, separated from the Jatulian a supposedly older division, which they called Kalevian. In 1916 it was proved by Mäkinen in the Kemi-Rovaniemi area and by P. Eskola in Russian Karelia that there is no difference in age between these, but only in their grade of metamorphism and sedimentary facies. Eskola also concluded that the folding of the Ladogian, Kalevian and Jatulian has taken place in one and the same orogenic cycle for which he proposed the name Karelian, now in general use. Ramsay joined in this conclusion, whereas Sederholm adhered to his view that the Ladogian is old Archean, possibly even older than the Bothnian, whereas the Kalevian and Jatulian are later than granites of postbothnian type. He revised his opinion after 1927, when C. E. Wegmann came to Finland and here applied the concepts and methods of Alpine tectonics. In his paper of 1928, on the younger folding in East Finland, Wegmann considers the relations of different formations as depending on their position in the geosyncline. The Jatulian quartzite is the deposit on the continent bordering the trough, the Kalevian the Flysch sediment of the littoral sea, and the Ladogian the sediment of its central parts. These characters are independent of the age. In the Karelian zone, stretching NNW from Lake Ladoga, the Jatulian basal conglomerate and quartzite lie on the gneiss granite with westerly dip, overlain by dolomite and pelite, on which follow strongly metamorphic schistose layers of Kalevian and Ladogian types. They are, as all Karelian layers, overthrust eastwards, as shown in Wegmann's profiles.

Sederholm, in a memoir of 1932 accepted the views of Wegmann, although he still thought that the Ladogian may be Prebothnian. At present, admitting the fact of eastward overthrusts, but not the high

metamorphic grade of the Ladogian as proof of an old age, I would think it most plausible that the succession of layers in the Karelian zone is largely original, though not autochthonous. Especially the numerous mantled domes in East Finland seem to point to this conclusion, as they mostly present a typical Jatulian sequence, sometimes with basal conglomerate undermost, though all layers are disguised by strong metamorphism and migmatization. It is equally evident, on the other hand, that older, Prekarelian supracrustal formations also exist, at least east of the main Karelian zone, but possibly in that zone itself as well. The Lapponian of Sederholm, with jaspilitic quartzites and quartz-banded iron ores, overlain by the Kumpu conglomerate, demonstrates a bipartition of the Karelian, but not the existence of two geosynclines or orogenic cycles.

### Regeneration of Granites

Many features of the Finnish Archean indicate a higher age of the Svecofennides as compared with the Karelides. The latter show in Karelia architectonics of the Alpine type with geosynclinal and epicontinental sediments, a constant easterly vergence and overthrusts. The Svecofennians, again, are more commonly isoclinally folded and the structures display the characteristics of the intrusion tectonics. The bottom of the Svecofennian sediments has nowhere been found with certainty, whereas in the Karelides there are, in many tracts, conglomerates deposited on the gneissose granite underlying vast areas in East Finland and containing pebbles of the basement rocks, among others of granites similar to the Postbothnian ones. The gneissose granite, on the other hand, embraces inclusions of sedimentogenous schists similar to the Svecofennian metamorphics. I shall not here enter more closely into the problem of the relative ages but will add a note on another apparent difference which is independent of the age, namely, the regeneration of the granites that is far more intense in the Svecofennian than in the Karelian territory.

As appears from the recent radiologic determinations outlined in the next chapter, most granites in the Svecofennian have been emplaced during the Karelidic orogenesis. Some granites are synkinematic, more or less gneissose and primarily rather poor in potassium. Metasomatic replacement of sodium by potassium in plagioclase, easily traceable microscopically, is more or less advanced in the synkinematic rocks. In the recent explanations to the new map sheets the phenomenon is mentioned so often that one wonders whether there are any acid or intermediate plutonites left untouched by it. In wide areas the process has been complete enough to yield typical microcline granites, so common in our Archean. In them only the relict texture testifies to their mode of origin. Illustrative examples have been described, e.g., by A. Simonen.

Other granites are late-kinematic, largely potassium-rich. Some of them have been formed by primary crystallization of eutectoid granite magma, others by granitization and potassium metasomatism of earlier rocks. Many of these granites show "ghostly" remains of the structural pattern of sediments, others have relict textures after more or less basic magmatic rocks. As easily appears from a comparison of chemical analyses, granites can not originate from normal sediments without considerable addition of certain granite elements supplied by their juvenile upward migration from deeper levels.

I have discussed the granite genesis from the viewpoints presented by E. Szadeczky-Kardoss, based on the conceptions of "wichtes" of the ions and atoms, involving upward diffusion of the lighter elements, and on the ionic and bonding potentials, whose numeric values vary parallel to the sequence of crystallization of minerals. Application of these concepts leads, in an elegant manner, to a satisfactory theory of the genesis and development of the plutonic rocks.

The granite genesis is a geochemical phenomenon characteristic of the orogenies. The Karelidic regeneration has been most intense in the Svecofennian areas, producing in West Finland synkinematic intrusions, zones of migmatites, in certain zones developed into metasomatic granites, as the Hanko granite, and magmatic late-kinematic granites. Rather similar conditions obtain in South Lapland, but there the granites invade metasediments like quartzites which were of old classed with the Karelian. Karelia and Kainuu have far less karelidic granites, although there may exist more of them than is known so far. The whole province has to be remapped. But there we meet with products from an older orogenic cycle, the eastern Prekarelian gneissose granite, and the still older formations enclosed by it. It remains to be found out, to what extent this older orogeny has caused regeneration and granitization.

### Absolute Ages

The first determination gave for a pegmatite in the Svecofennian the age of 1800 million years. We expected that the Karelian granites would prove much younger,

especially as a determination on the Bohus granite in Western Sweden, believed geologically to stand near the Karelian in age, had given an age of about 8.5 m.y. The first determinations on Karelian rocks were performed by H. S. Shillibeer in Toronto on the granite of Maarianvaara, as reported by A. Kahma in 1956. To our surprise seven samples gave all about the same age as the Svecofennian granites. At the same time E. K. Gerling determined ages of granites in Soviet Karelia with results largely in agreement with those of Shillibeer.

As the determinations so far had been made by the potassium-argon method that was not regarded quite reliable, age determinations of several Karelian and Svecofennian granites by all current methods were carried out by Olavi Kouvo 1955-1957 in the U.S.A., under the guidance of the foremost specialists. His results were published in 1958. For rapakivi and other postkinematic granites the age found was 1620 m.y. for the Svecofennian and Karelian granites again about 1800 m.y. No higher ages were found for any Svecofennian rock, and later also the feebly metamorphosed Bothnian sediment has been found to be of the same age. The same was true of the Karelian granites, whereas for the basal gneissose granite of the mantled dome at Sotkuma and (later determined) below Jatulian quartzite at Koli determinations by the lead-isotope method on zircon gave 2530 m.y., whereas determinations by the rubidium-strontium method yielded the usual 1800 m.y.

Kouvo also investigated galenas from seven sulphide deposits in the Svecofennian which all gave for the lead an age of about 1800 m.y. or the granite age, and six in the Karelian, of which one gave 2750 m.y., three 2100-2300 m.y., and two 1800-1900 m.y. From Soviet Karelia Gerling reports K-A for micas about 1800 m.y., but also 2000-2500 m.y. and, from Kola, up to 3480 m.y., which is one of the highest rock ages ever found in our globe.

The new data have been interpreted as proving that there is no difference in age between the Svecofennian and Karelian. To this I maintain that the facts known so far rather suggest a large scale regeneration of the Svecofennian crust in connection with granite genesis during the Karelide orogeny, as otherwise it would not seem possible to account for the equality of the age figures within a vast area where certainly various rocks existed before the revolution 1800 m.y. ago. Many a rock must have been rejuvenated!

Shortening of ages of minerals and rocks is well known to the radiologists. In many cases it has been accounted for by leakage of the radiogenic stable nuclides. Loss of argon, e.g., is to be expected at granitization. Rejuvenation, however, may also be due to the addition of radioactive nuclides, especially at the granite genesis. $K^{40}$, as appears from its half-life, has some two milliards of years ago been more than twice as abundant as it is now; the quantities of uranium and thorium also have been far larger. With the addition of immense amounts of potassium, the $K^{40}$, also, must be greater in quantity than before the granitization, in spite of its diminution by transformation to argon. When, in the Baltimore gneiss, the age of biotite was found to be from 310 to 390 m.y., while that of zircon and microcline was more than 1000 m.y., this can most easily be explained by assuming that the micas were produced and their elements added by metasomatic metamorphism later, during the Appalachian orogeny.

All over Fennoscandia, Ukrainia, Kazachstan, and elsewhere in the wide Fennosarmatian shield, the same "Karelian" age has been found for Archean granites. If the age of a rock has at all a real meaning, this must imply that the age of granite in this area 1.8 milliards of years ago, if measured by the methods now in use, would have been O years. In the Svecofennian the regeneration proceeded to an end, whereas in the Karelian the lead isotopes resisted the process, although cases are also known where lead ages are shorter than K-A or Rb-Sr ages.

Had the Finnish Precambrian been befallen by the Variscan orogeny, rejuvenation of some minerals would no doubt have taken place in the manner of the Baltimore gneiss, or the European Variscides. Late-Precambrian or Assyntian age has been ascertained geologically for some rocks in Bohemia, Saxo-Thuringia, Black Forest, Brittany, etc. Mehnert has recently determined many ages of the Black Forest granites and metamorphics by the K-A method. He finds for the last pegmatitic crystallizations about 250 m.y., for Variscan magmatites 260-300 m.y., for metamorphics and their products of granitization 280-360 m.y. Some, though not very considerable, rejuvenation is here also in evidence.

The age determinations carried out so far have given immense impulses for further research in Finland. Radiologic determinations must be made in much greater scale for solving the age problems. The geological field research must be intensi-

fied, revision of the geological maps extended to most areas.

Much has been achieved in the recent years. The number of geologists employed by the Survey is now about ten times as great as it was when Sederholm left it. After the finishing of Geological Survey's new house in 1956 the working possibilities have increased enormously. Modern scientific equipment for geophysical prospecting, optical and spectrographical investigations, X-ray work and many other branches have been acquired. New series of geological maps in greater scales than before, have been initiated. The startling results of the first determinations of the absolute ages, which, as we hope, will soon be continued with our own powders, means a landmark, as though we were given the command: Begin from the beginning!

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**SOC ET TUUM**

*(Continued from page 22)*

*And its age I can soon explain*
*But when I find a fellow*
*He never seems to mellow*
*Oh, you can't get a man with your brain.*

*When I meet a crystal*
*I simply can't desist'til*
*I have made all its faces plain;*
*But those plain crystal faces*
*Will never get you places*
*For you can't win a man with your brain.*

The song ends with this bit of philosophy:

*Be warned by this ditty*
*A girl who isn't pretty*
*Has a chance for romance, its plain,*
*If she acts like a moron*
*She'll get her man to score on;*
*It's a practical rule:*
*Out of school, play the fool*
*For you can't get a man with a brain.*

The programs for the shows have, from an early date, been works of art. In 1916 the idea of patterning the format after well-known scientific publications came into vogue. In the past there has been "Sceance," "American Jeernal of Scions," "Interminable Proceeding of the Geosophical Society of Atlantis," "The Ameritous Minorallergist," and of course, "Geo Crimes." Inside the songs are reproduced with satirical titles and quips. One of the features is the yearly addition of several verses of the "I wonder why" song, which since before 1910 has served as a sort of irrational anthem of the club. The verses, which have been numbered consecutively, are now approaching 300. These songs deal with topics that are close to the Survey's heart, and consequently most of them have a strictly local theme. There are a few which are still topical, however, after many years.

Here's one from the 1928 show:

*A most complicated science paleontology I find*
*I wonder why, I wonder why.*
*With every passing year it grows a yet more fearful grind*
*I wonder why, I wonder why.*
*For cleaning up of fossils now a dentist's drill you see.*
*Is really necessary, for both trilobite and tree,*
*And soon to be an Aid you'll need a D.D.S. degree,*
*I wonder why, I wonder why.*

And here's another from the 1940 show:

*The men of vintage ninety-eight are held in veneration–*
*I wonder why, I wonder why.*
*Their work can't be improved on by the present generation*
*I wonder why, I wonder why.*
*So if you take as orthodox whatever they have said*
*Nor let ideas heretical e'er penetrate your head,*
*You, too, may be a Sacred Cow long after you are dead:*
*I wonder why, I wonder why.*

This just about sizes up what the Pick and Hammer Club does and is. If you're planning to be in or near Washington, and have nothing better to do on April 29, 1960, why not drop in and see the show?

# GEOLOGY in the Public Eye

by
Robert L. Bates
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Columbus Ohio

In less than a year, the Mohole project has become the most attention-catching activity of earth science. As the project moves from its early stages toward the actual drilling, we may expect public interest to intensify. How well will the purpose and value of the Mohole be explained to the layman?

In the AMSOC Committee's 20-page booklet (NAS-NRC Publication 717), the next-to-last sentence reads, "The problem is tangible, *the value is understandable to the general public,* the limits are reasonably assured." It is that middle statement, here italicized, that gives one pause. The main objective of the project, as stated in the report, is to explore directly "the depth of the crust and the outer edge of the mantle," along with the intervening Moho discontinuity. But right here we run into semantic trouble. To the layman, a *crust* lies on something hollow or soft (pie crust, bread crust), and to him it may seem quite reasonable to describe the project as "getting ready to punch a hole in the roof of hades" (AP story by Ralph Dighton, Dec. 5, datelined LaJolla, Calf.). If the average reader knows the word *mantle* at all, he thinks it's something thrown over something else; yet here is a mantle *under* a crust, and not only that but very dense. Although the Moho itself is presumably but a surface or thin zone, it gets described as "an extremely hard layer beneath the earth's rock crust . . . enveloping the mantle like a big tough balloon" (same AP story). And all this before getting to any explanation at all of the project's *value.*

The exciting potential results of the project—petrologic, evolutionary, and so on—are quite clear to the experts but mysterious to the uninitiated. To keep them from becoming hopelessly muddled in the public mind, could not the AMSOC people put a qualified man on the continuing job of interpretation for the layman? This isn't easy, but it can be done (see TIME for last April 6). It is suggested that not until the *what* and the *why* are explained in simple, accurate terms will the Mohole's value be "understandable to the general public."

## GEOPHYSICISTS LECTURE TOUR FEATURES MOHOLE

Willard Bascom, technical director for the Mohole Project sponsored by the AMSOC (American Miscellaneous Society) Committee of the National Academy of Sciences visited seven local societies of the Society of Exploration Geophysicists in November as a distinguished lecturer. Following is the abstract of Mr. Bascom's lecture on the Mohole Project:

"Man is the most curious of all animals. He rides a spinning sphere through space, all the time wondering where it came from, how old it is, what it is made of, and how life developed. Partial answers to these questions lie buried in the sediments of the deep sea floor, in the rocks of deep crust and in the mantle itself. Indirect methods of exploring the deep rocks have gone about as far as they can go. Therefore the AMSOC Committee of the National Academy of Sciences is preparing to drill a hole completely through the crust of the earth beneath the ocean to obtain continuous oriented cores of the crust and the rim of the mantle.

"The boundary between the earth's crust and mantle was defined by Professor A. Mohorovicic in 1910 as a discontinuity at which the velocity of seismic waves increased abruptly. In his honor it is commonly known as the Moho and so a bore hole to the mantle is logically called the Mohole. It will be the culmination of a project in which a series of experimental holes will be drilled for various scientific purposes.

"The oceanic crust is much thinner than the continental crust and the AMSOC Committee believes that if the best of modern drilling equipment is installed on a ship, the mantle can be reached. There are several places where the Moho comes within about 31,000 feet of the sea surface —only 20% deeper than the deepest oil well.

"Geophysical surveys of several sites are underway to determine oceanic currents and the depths to the various layers. Plans for holding a ship in position in deep water, for coring both very soft and very hard sediments, for precisely orienting logs and cores and for modifying a ship to do deep drilling are now being made. It is hoped that some preliminary test holes can be made in the soft sediment with some existing drilling ship by the summer of 1960. The extensive remodelling of a ship for deep drilling may begin about the same time.

"We believe that this program can be carried out and that the result will be a great stride forward for the science of geology-geophysics."

## MINERALOGY

*(Continued from page 29)*

ings likely to be attended by a significant number of mineralogists.

Thus at Zürich the first three days were given over mainly to the meetings of the commissions and the council, but also (on Aug. 31) a delightful reception by the Town and Kanton of Zürich. The final three days were devoted to two symposia, as well as to two business meetings; also evening trips to Schaffhausen, and on the Lake of Zürich. The symposia dealt with (1) the Alpine Fissure type of mineralization, and (2) Twinning. Speakers in the first symposium included Parker and Laves from Zürich, Fagnani (Milan), Grigoriev (Leningrad), and Lietz (Hamburg) under the chairmanship of Prof. Wenk (Basel). Those on twinning (Prof. Buerger, chairman) included Buerger, Donnay (in absentia), and Holser for the U.S., Ito and Sunagawa from Japan, Curien (France) and Neuhaus (Germany). These symposia together with a full description of the meetings are to be published early in 1960 by the Instituto Lucas Mallada of Madrid; further details may be obtained from the Secretary of the IMA, Prof. J. L. Amorós, Castellana 84, Madrid.

The two four-day field trips through the Alps were well attended and well conducted in beautiful sight-seeing buses. The east one led by Burri, de Quervain, Wenk, and Wiebel went south from Göschenen over the St. Gotthard Pass down to Locarno (first night), then east over Splügen pass to Maloja (second night), then on down the Engadine almost to St. Moritz, but turned north over the Julien Pass to Bivio (third night), then north to Chur, where a train was taken back to Zürich. The west one, led by E. Niggli, Nowacki, Hügi, and Styger, went south from Lucerne over the Grimsel Pass and west down the Rhone to Binn (first night), then back east over the Furka Pass to Hospental (second night), then east through the Oberalp Pass to Sedrun (third night), then south to Acquacalda and back to Göschenen, from where the party returned to Zürich by train.

While the efforts of many individuals were involved in bringing off such a successful first meeting, particular praise should got to President Parker and his Zürich personnel.

## KILAUEA

*(Continued from page 27)*

often shooting high in sudden repeated bursts, depositing pumice as far as 5 miles to the southwest (Fig. 5). Had the wind shifted during any of the eruptive periods, and blown from the south, as is often the case in Hawaii during the winter season, the housing area for the National Park would have received a blanket of basaltic pumice up to 2 feet thick. Persistent trade winds have also spared us from the acrid and nauseating gas fumes which persist for as much as 50 miles downwind from the vent.

As of December 17, 1959, just over one month after the initial outbreak, and the date of part of this writing, we have had a total of 15 separate eruptive phases. During the week-long first phase forty million cubic yards of lava were poured into Kilauea Iki, forming a lava pond 335 feet deep. The fourteen subsequent eruptions have been of much shorter duration and have contributed an additional 17 million cubic yards of lava to the pond, increasing its depth to a maximum of 414 feet at the end of the 8th phase (Fig. 6). Although the duration of the later eruptive phases has decreased, the rate of lava output has increased. In the first stage a maximum of 470,000 cubic yards per hour was measured during the last day of that phase; the tenth phase spewed out its lava at the phenomenal rate of 1,400,000 cubic yards per hour!

The temperature of the lava in the fountain is consistently being measured above 1120° C. On December 5, 1190° C. was recorded, which as far as we can determine is the highest temperature ever observed for Hawaiian volcanoes. The high temperatures seem to correlate with the generally "primitive" undifferentiated nature of the lava being erupted.

The large pumice and cinder cone which is being built in the lee of the fountain, had an approximate elevation of 3910 feet at the end of the seventh phase of activity, or about 150 to 200 feet above the irregular platform on which it rests. Chester K. Wentworth, geologist, is investigating the physical properties of the pyroclastic debris which forms the cone and is following the changes in volume of erupted material. The cone is already a dominant physiographic feature in the National Park.

One of the many interesting facets of the 1959 eruption is the withdrawal of liquid lava back into the vent when fountaining ceases. This phenomenon has been noticed ever since the end of the second phase when the level of the lava in the pond rose above the volcanic vent. In fact from the end of the sixth phase almost all the lava erupted has poured back down the vent. As viewed from above along the crater's rim, the backward flow of lava toward and down the orfice has at times resembled a bathtub full of water with its drain plug removed. Even the rings show as the lava drains out and the pond surface sinks (Fig. 7)! The rates for this withdrawal are also phenomenally high. Although less accurately determined than the extrusive rates, backflow has been measured at rates exceeding 2,000,000 cubic yards per hour or almost twice the average rate of extrusion. Whether the lava that has been extruded during the later stages represents entirely a fresh batch or merely recycled pond lava with enough primary magma added to recharge it with gas for the push to the surface, is a significant problem that is not yet resolved. Jack Murata, who has been turning out silica analyses almost as fast as the lava is being ejected, remarks that it would be a shame if he were analyzing the same old stuff over and over again. Percent silica varied between 46.3 and 49.5 during the early phases but has more or less stabilized at 46.8 since the fourth phase. We are beginning to think in terms of "lava geysers" at the Observatory.

We hope that this very informal story of the 1959 Kilauea eruption will serve to answer a few of the questions that undoubtedly have arisen since the eruption began and to show briefly what investigations are being made by the U. S. Geological Survey. Needless to say the writing of this article has been rather hectic. We started at the end of the seventh eruptive phase, but were interrupted by phases 8 through 15. We hope that before too long we can go back to more normal hours—whoops, have to wait a little while longer, phase 16 has just started!

## DEPLETION

*(Continued from page 38)*

cents per barrel. Total shortage suffered by Royalty Interest owners in 1955 was approximately $56,005,158. Geologists and Land Men should so inform all the Land Owners who are Royalty Owners in the United States, that their private property in the form of Capital Assets are being confiscated by Government in guise of taxable income.

In acting during the Congressional hearings, geologists and landmen will be discharging a civil responsibility as citizens which is just as incumbent upon them as their obligation to bear arms in defense of our homeland.


## BOOKS RECEIVED

VECTOR SPACE AND ITS APPLICATION IN CRYSTAL-STRUCTURE INVESTIGATION, *by Martin J. Buerger, 347 pp., 1959, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York. $12.00.*

A systematic treatment of vector space and its application in crystallography.

OPTICAL MINERALOGY, *3rd Edition, by Paul F. Kerr, 442 pp., 1959, McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. $8.50.*

Revision of Rogers and Kerr with new mineral data and discussions of new techniques.

DANA'S MANUAL OF MINERALOGY, *17th Edition, revised by Cornelius S. Hurlbut, Jr., 609 pp., 1959, John S. Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $11.50.*

A revision of the sixteenth edition which was published in 1952. "Crystallography" has been expanded as has the section on "Crystal Chemistry."

AMERICA'S WONDERLANDS, THE NATIONAL PARKS, *512 pp., 466 illus., 390 in full color, National Geographic Society, 16th and M Sts., N. W., Washington 6, D. C. $11.50.*

A colorful portrayal of 82 scenic areas which emphasizes the geologic beauty of the National Parks.

ANGLO-AMERICA, A REGIONAL GEOGRAPHY, *by Earl B. Shaw, 48 pp., 1959, John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.75.*

A text discussing Anglo-America by regions.

OUR MINERAL RESOURCES, *by Charles M. Riley, 338 pp., 1959, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., $6.95.*

An elementary textbook in economic geology in two sections; I. Metallic Minerals, II. Nonmetallic Minerals.

ECONOMICS OF THE MINERAL INDUSTRIES, *edited by Edward H. Robie, 755 pp., 1959. Seeley W. Mudd Series, Amer. Inst. of Mining, Metallurgical and Petroleum Engineers, 29 West 39th St., New York 18, N. Y. $10.00 (30% discount to AIME members).*

Over 30 authors contribute 18 chapters with a foreword by Herbert Hoover.

MINERALS OF ARIZONA, *Third Edition, by Frederick W. Galbraith and Daniel J. Brennan, 116 pp., 1959, Physical Science Bulletin No. 4, University of Arizona Press, Tucson, Arizona, $1.00.*

APPLIED PETROLEUM RESERVOIR ENGINEERING, *by B. C. Craft and Murray F. Hawkins, Jr., 437 pp., 1959, Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $12.00.*

An up-to-date coverage of reservoir engineering based on new knowledge and current terminology.

READING GERMAN FOR SCIENTISTS, *by Hans Eichner and Hans Hein, 207 pp., 1959, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $5.25.*

A book to serve the needs of the scientist wanting to develop a reading knowledge of German with a minimum of effort.

## Abuses Other Than Italic [1]

Professor Unklesbay correctly draws attention to the misuse of italic. Three other misuses in recent General, Physical, and Historical texts, may also be noted.

DATA—The unfortunate and "indiscriminate use of this valauble plural noun, so directly borrowed from Latin" is mentioned by Leggett.[2] It is substituted for: information, evidence, facts, figures, grounds, proof(s), reasons, terms, cases, references, indications, principles, knowledge, etc.

SINCE – Indiscriminately and unwisely this word is used to mean: as, because, whereas, although, for. In one sentence it may be used in two or more different senses. Such misuse is particularly annoying and ambiguous in a science which deals with time relationships.

COMIC-BOOK DRAWINGS – As chapter headings and end pages, such drawings cause many students to assume that geology is easy and descriptive and that examinations may be answered by a few "popular" sketches.

[1] PATRICK ARTHUR HILL, University of Tasmania.

[2] LEGGETT, ROBERT C., 1958, Landslides and Engineering Practice—a review: Econ. Geology, v. 53, p. 898.




DEAR EDITOR:

Please permit a Caledonian intrusion. There was a minor earthquake here this month when Hutton, Lyell, and others of whom you have heard turned in their graves. Your data sheet 14 on the Geological Surveys of the World omitted Scotland!

Yours faithfully,

C. F. DAVIDSON
University of St. Andrews
Fife, Scotland

DEAR SIRS:

I have read much in your magazine regarding the teaching of earth science in the public schools, but no one has suggested how it can be accomplished. There are two suggestions that are fairly obvious, but both depend on the teaching of science in the 7th and 8th grade—a practice that is, regrettably not universal, to say the least. One idea is to teach one semester of earth science, probably in the 8th grade. This is quite easy if there are three 6 weeks grading periods. Then one grading period can be devoted to geology, one to astronomy, and one to meteorology, generally in that sequence. I did this last spring in an 8th grade science class, and it worked out very well.

The other is to teach general science in the 7th and 8th grades and in the 9th give earth science, 10th biology, 11th chemistry, and 12th physics.

I believe that a great deal can be done along either or both of these lines, but it will take selling. I believe that both proposals are practical, and that at least one can be worked into most present systems if there is already a junior high setup. I would appreciate having this printed, if possible, and would appreciate comment, both in the magazine and by personal correspondence, which I will do my darnedest to answer.

Sincerely,

JOHN E. PETERSON,
530 S. Washington St.
Paxton, Illinois

DEAR SIR:

I feel compelled to express my surprise that you as editor, would publish a note as apparently fraught with misapprehensions as that entitled "The Abuse of Italic" in the September issue of GeoTimes, without some further explanation.

In defense of Stirton, Stovall and Brown it must be pointed out that their usage is not in "bold defiance of the international rules of zoological nomenclature" but in scrupulous conformity with them. Surely it is generally known that if italic type is used in a passage for any reason (in the case under discussion in captions of illustrations), one italicizes by returning to regular type. Possibly the author of "The Abuse of Italic" is aware of this but does not approve of it.

I quote: "With all the varieties of type available to printers and with the many ways of expressing emphasis by grammatic construction, it seems that we should not tolerate this abuse of italic type which has for so long had limited special significance." The point seems to be that in a geologic publication one should adhere to the technical usages of italics only, eschewing usages regular in ordinary non-technical English. This seems to me to go too far. In English the practice of using italics to emphasize a word (any word) is not only very common but quite proper. Since Stirton writes in English should he not be accorded the privilege of regular usage? Particularly when writing a teaching text rather than a technical article.

Sincerely,

F. C. MACKNIGHT
Pittsburgh, Pa.

DEAR EDITOR:

I should like to juxtapose statements by two different people in the October (1959) number of GeoTimes; p. 34 "The country has a President, the President has a Science Advisory Committee, and the committee has a membership that leaves the earth sciences out in the cold—as usual." p. 52 "However, one can but wonder if the drilling of the Mohole is more important than a dollar-equivalent investment in geologic mapping, geochemical research and other less glamorous types of geological research which remain undone." I can't help wondering whether the attitude reflected in the second sentence may not be a major factor why representation of the earth sciences is so often neglected. Such a uniformly conservative policy never would

have led to the development of atomic power or the exploration of the ocean basins.

I have always strongly advocated the necessity of maintenance and growth of appropriate work in field geology along with the recent tremendous expansion of work in Geochemistry and Geophysics. But even if a billion dollars were spent on geologic mapping and geochemical research we would not come on into nearer to absolute knowledge of the kind of data that it is sought to answer by drilling of the Mohole. And we need this data rather than thousands of more pages of academic speculation. Also, the engineering knowledge learned in drilling such a hole will certainly be of very great value.

The Mohole may not be the best of all possible projects but it will be hard to suggest better ones. Representatives of the earth sciences must exhibit realistic forward-looking vision if we are to properly advance our sciences and command respect.

A. F. BUDDINGTON
Princeton, New Jersey

DEAR EDITOR:

With interest we note the increasingly frequent appearance of the terms "geoscience" and "geoscientist." In view of the wide scope of activities of AGI, would it not now be appropriate to rename this organization the American Geoscience Institute or the American Geoscientific Institue? The affiliated organizations are geophysical and geochemical as well as geological, are they not? Our literature is abstracted in the "Geoscience Abstracts."

C. E. JACOB

GENTLEMEN:

Enclosed please find my personal check to continue my subscription to GeoTimes for the next calendar year. Thank you for bringing this to my attention.

I wish to take this opportunity to compliment the staff of the GeoTimes for the excellent job they have done. I consider receipt of the GeoTimes as one of my highlights each month.

If each of the dollars I spent gave me as much satisfaction as the dollar for GeoTimes subscription, I would consider myself a wealthy man even with the restrictions of a meager salary.

ROBERT H. RUSSELL

## MIGMATITES

*(Continued from page 37)*

which igneous rocks are considered to have been derived by solidification. It consists at least "in noteworthy part" of a liquid silicate-melt phase, which is liquid owing to the temperature attained, and may contain a number of solid phases such as suspended crystals and also a gas phase—It is perhaps bad that carbonatite magmas and "sulphide magmas" are delimited by this definition. (Barth and Eskola believe that *sensu strictu* magma should refer to the molten part. Barth adds that *sensu lato* it could include solids and gases; alternatively, Eskola maintains that magma plus solids should be called migma.)

METAMORPHIC ROCK—rock formed from preëxisting rock in response to changes of temperature, pressure, and/or chemical environment. It is generally considered that the changes take place in the solid state and below the shells of weathering and cementation. (A few prefer to substitute "without the material's ever existing in a predominantly liquid state" for "in the solid state." Of course, acceptance of this alternative would expand metamorphism to include such things as some partial anatexis. This emphasizes the difficulty of classifying certain rocks as metamorphic versus igneous!)

METABLASTESIS – relatively high temperature, essentially *in situ* chemical rearrangement, *i.e.*, recrystallization not involving long-distance transfer of materials.

MIGMATITE—a visibly (megascopically and apparent in exposures measurable in a few square meters) composite rock that consists of igneous or igneous-looking and/or metamorphic materials. (The Finns do not require the megascopic restriction; the Danes use Wegmann's definition: "a rock which consists of two or more components of different origin but intimately mixed so that a uniform rock results on a scale from 10 cm. to 1 m. One of the components is the pre-existing rock, the other or others have been formed by various processes—immigration of different kinds, exsolution of part of the rock, recrystallization with or without reactions, *etc.*")

NEBULITE—a type of mixed rock characterized by indistinct, streaky inhomogeneities or schlieren and in which no sharp distinction can be made between the component parts. (Term is not used by Swedes and most Norwegians.)

PALINGENESIS—the process of formation of new magma by the melting or fusion of country rocks *in situ*. (Although it is used in this way by many geologists, the term may be rendered superfluous if defined in this way—see anatexis. However, many others use it in a much broader sense—the formation of "new" rock by anatexis and/or essentially complete metasomatism of preëxisting rocks.)

RHEOMORPHISM – a process of at least partial fusion, such that the rock may be deformed viscously. (The Finns and some of the Swedes avoid this term if possible.)

SUPRACRUSTAL (adj.) – in petrology, refers to rocks formed at the surface of the earth.—This includes sedimentary and volcanic rocks. (*Infracrustal* is used by some geologists to designate rocks formed below the surface.)

SYNTEXIS—(comment only—this term has fallen into disuse for the most part. Of those who use it, some consider it as synonymous with partial anatexis and others consider it as synonymous with hybridization dependent upon incorporation of wall rock material into a magma.)

VEINED GNEISS—an irregularly layered composite gneiss (see Fig. 1b).—The term is applied to irregularly banded arteritic, ectectic, and venitic gneisses.—It is a descriptive field term, with no genetic implications, and is synonymous with some workers' *"phlebite"*. (The Danes restrict the usage to gneisses, the quartzo-feldspathic portions of which are subparallel or regularly branched; they use the term "net-veined gneiss" where these portions are extremely irregular.)

VENITE—a veined gneiss the veins of which were formed as the result of some permeation process (*e.g.*, metasomatism or nonmagmatic exudation from the host rock).

In preparing the questionnaire I attempted not only to collect the above information but also to see if, in any way, certain agreements might be reached so far as establishing two categories of terms for some of the rocks—one descriptive and nongenetic and the other genetic. The hope was to clarify the terminology and thus to give more meaning to our argumentation. It was particularly gratifying to find that nearly all of the geologists who responded were most anxious to do this—even though it might mean changing some of their own usage. One good case in point is the way my suggestion concerning the nomenclature of "granites" was accepted. It was suggested that *granite* unmodified be used as an essentially nongenetic descriptive term and that on a genetic basis there should be three main types of granites—

## Macelwane Meteorological Award

The American Meteorological Society announces the Father James B. Macelwane Awards in Meteorology. Three prizes of $150.00, $100.00, and $50.00 respectively, will be awarded for original papers on any phase of meteorology. The contest is open to registered *undergraduate* students in any college or university in the Americas. Entries will be accepted up to February 1, 1960. All papers should be submitted to the *Chairman of Judges, Prof. Jerome Spar, Department of Meteorology and Oceanography, New York University, New York 53, N. Y.*

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*igneous granite*, granite solidified from a magma; *metasomatic granite*, granitized granite as to the above definition of granitization; and, *metablastic granite*, granite formed by essentially simple recrystallization of preëxisting granitic composition rocks such as arkoses. All agreed to the advisability of adopting this.

I hope this nomenclature preview will serve to whet your desires to visit the Scandinavian migmatite and similar rock types localities. They are truly superb!

### Addendum

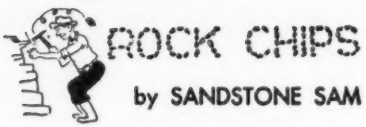
After this compilation of Scandinavian usage was made and prepared for publication, I learned that Professor K. R. Mehnert, Director of the Mineralogical Institute of the Free University of Berlin, had independently made up a rather complete list of petrologic terms and definitions for migmatites and associated rocks. He very kindly put his compilation at my disposal. I also have been informed that my original questionnaire has recently been distributed to 6 or 8 other European petrologists with a request that their comments be sent to me.

Unfortunately Professor Mehnert's compilation and the other petrologists' responses were received too late to make practical their review and consideration by the original Scandinavian respondents. The added aspects will be reported later. The widespread interest suggests that we may be on the threshold of real clarification of petrologic nomenclature usage. The XXI International Geological Congress meetings may afford a good beginning for correlation of, if not coördination of, this part of the language of petrology.


Get Me Out. 16 mm. Sound. Color. 30 minutes. 1958. Here is a story of oil production—building a rig, spudding and drilling the hole, mixing mud, coring rocks, examining samples with ultra-violet light, fracturing, installing the Christmas tree, switching and gaging, maintaining pressures under variable reservoir conditions, and eventually working over old wells to increase production. This film, one of a series prepared for instruction of company employees and now available to educational institutions, is well organized, carefully filmed and instructive. Useful for those who wish to learn something about the complex business of finding and producing oil. Distributor: *Pure Oil Co., 35 E. Wacker Drive, Chicago 1, Illinois.*

Hot Earth. 16 mm. Sound. Black and white. 21 minutes. 1954. *Reviewed by Brainerd Mears, Jr.* This travelogue-type film, produced by the New Zealand Tourist and Publicity Department, is of geologic interest, for it provides many good views of New Zealand's fumaroles, geysers and hot springs, with some impressive concluding scenes of geysers in eruption. Also shown are some nearby volcanoes, the uses made of natural steam in the region, and Maori natives with unusual legendary history. Elementary in approach. Best suited for high school or introductory college classes in earth science. Distributor: (for U.S.A. loans only) *Wyoming Film Library, University of Wyoming, Laramie.*

Refining Copper from Sudbury Nickel Ores. 16 mm. Sound. Color. 39 minutes. 1959. *Reviewed by Oswald C. Farquhar.* This recent film, the fourth in a series covering the mining and smelting of Sudbury nickel and copper ores, explains both the theory and practice of electrolytic separation of copper from ions with different electromotive force. There are especially good views inside a furnace, showing green hard wood being added to the melt to liberate gases and form elemental copper with an extremely low oxygen content. Sampling techniques for quality control are described and the advantages of vertical casting discussed. An instructive and enjoyable film. Particularly suitable for classes in mining and geologic engineering. Distributor: *Rothacker Inc., 729 Seventh Ave., New York.*




*From a GeoTimes reader in New Zealand we hear that on the same exam two students wrote "Earthquakes are due to the elastic-rebound hypothesis"—A world-shattering theory, no doubt.*

• • •

*Friends: People who dislike the same people.*

• • •

*Clarification: has been described by one geologist as a process of filling in the background with so many details that the foreground goes underground.*

• • •

*A college freshman has defined a laccolith as the "pregnant equivalent of a sill."*

## Ode to His Colleagues by an Englishman

*(A Briton)*

*Alas for Mull, in England now,*
*The North-west Highlands, I avow*
*Will never be the same again,*
*For A.G.I., with fickle pen,*
*On data sheet fourteen*
*Avoids the Scots, eschews the Welsh,*
*removes the Ulstermen.*
*Oh shades of Hutton, can we state,*
*Great Britain's share of real estate*
*And obviate this awful doubt:*
*U.S.G.S. has left them out.*
*But Edinburgh revive!, Belfast stand true!*
*We'll grant them pardon and accept*
*correction which is due.*

*P.A.S.*

## Geology in the News

The Pittsburgh Sun Telegraph ran a special limited circulation edition on November 3 with the entire front page devoted to the GSA meeting and carrying the bold-faced headline reading, *"1,600 Geologists Down to Rock-Bottom Talks."* Actually final registration topped 2100 in Pittsburgh.

The following week in Texas the Houston Chronicle for November 11 carried a story headlined as follows, *"Oil Chemists in Gulf States Meeting Here."* The article went on to talk about the "oil scientists" meeting in Houston. The only mention of the time-honored profession of geology was in the name of the association sponsoring the meeting of the "oil chemists"—the Gulf Coast Association of Geological Societies.

## SLICHTER HONORED BY AIME

Dr. Louis B. Slichter, Director of the Institute of Geophysics at UCLA, is the recipient of the 1959 Daniel C. Jackling Award of the AIME in recognition of his work "in applying the principles of geophysics to practical problems in mineral exploration." He will present the Jackling lecture at the annual meeting of the Institute in New York, February 14-18. His lecture will be on the "Need for a New Philosophy for Prospecting."

## Geologist Dean at Miami

Geologist Karl E. Limper was recently appointed Dean of the College of Arts and Sciences of Miami University (Ohio). Dr. Limper has been a member of the Miami Faculty in geology since 1939 and was appointed chairman of the department of geology in 1956 upon the retirement of the late W. H. Shideler.

### TRAVELING SCIENCE

*(Continued from page 34)*

ments in approximately 100 schools have been visited.

What do these traveling scientists do on their vists, and what is the response to what they do? They hold conferences with science teachers concerning teaching needs and problems. They talk about student projects for science fairs, exhibits, and other competitions; they discuss procedures in the development of such projects. They may give demonstrations, and they commonly present illustrated talks in scientific fields of their interests or related to their experiences. They distribute teaching aids to teachers, including reference materials for both teacher and student, lists of source materials, and sheets explaining demonstrations and experiments that can be used in the science classroom. They may even talk to individual students who have specific interests and desire information for special projects.

Geology? True, many teachers confess to limited knowledge of the science. Many science teachers, however, want to know more about the subject for developing units in general science and for incorporating geology in other science courses. Some would like to initiate courses in earth science.

Let us look specifically at how the traveling scientists present geology. Mr. Sims,

who professes an interest in geology almost as great as in biology, mentions geology wherever possible. This he finds relatively easy to do in western Kansas, famous for the fossils in its chalk beds and alive with oil and gas exploration. More important, he is finding a great deal of interest in geology in many of the schools visited, and to date he has visited schools in all parts of western Kansas and has talked before 50 to 60 science classes.

On his visits, Mr. Sims shows examples of materials available from the Kansas Geological Survey, hands out certain materials provided for this purpose, and for other sources of geological information gives such references as the American Geological Institute. He refers to the AGI educational program and the future availability of a sourcebook on geology and related sciences developed under the guidance of AGI.

Mr. Cline gives geology similar treatment. He has an exhibit of geological information, including Geological Survey and AGI materials, and some of his handout materials are geological. He has visited about 25 of 50 schools in his area that so far have requested a traveling scientist. He reports good reception.

Dr. Swineford and Mr. Hornbaker, who understandably have a tendency to stress geology, have visited about 40 of the approximately 90 schools in their combined areas that have to date asked for traveling scientists. Both are prepared to lecture on geology when asked. Dr. Swineford, for example, has presented with good reception at many schools an illustrated talk on the geologic history of Kansas. (To show certain past geologic environments she made colored slides from sketches drawn by Dr. Raymond C. Moore, geologist-artist who is Distinguished Professor at The University of Kansas and currently president of the American Geological Institute.)

Dr. George Cleland, director of the Division of Instructional Services, and Mr. Warren Bell, science consultant, in the Kansas State Department of Public Instruction, have given their blessings to the program. They also look with favor on the teaching of earth science at the junior high or senior high level. As proof, they are placing a preliminary copy of the AGI sourcebook on geology and related sciences with a Kansas high school science teacher for evaluation.

By creating a greater awareness of geology, the traveling scientist program is helping to set the stage for more earth science in Kansas schools.

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## VACANCIES

GEOLOGIST, Ground water, Ph.D. Research on ground-water geology, teach one course. Salary commensurate with training, experience, publications. Write Carl C. Branson, Director, Oklahoma Geological Survey, University of Oklahoma, Norman, Oklahoma.

GEOLOGIST-EDITOR. Ph.D. desirable. Geologic investigation, writing and geologic editing. Ability to write and to edit essential. Salary open. Write to Carl C. Branson, Director, Oklahoma Geological Survey, University of Oklahoma, Norman, Oklahoma.

GRADUATE ASSISTANT wanted immediately to join small team doing research in high pressure chemistry including geochemistry. Appointment for one year with possibility of extension and of getting higher degree. Will also consider now applicants for similar position to start next fall. Dr. R. S. Bradley, Department of Inorganic & Structural Chemistry, University, Leeds 2, England.

EXPLORATION GEOLOGIST with Ph.D. or equivalent experience required for work in southwest by substantial mining company. Interest and ability in surface mapping, and basic knowledge of ore deposits essential. Some grounding in geophysics desirable. Careful and confidential consideration of applications. Box 114.

ASSISTANT PROFESSOR—to teach general geology, paleo-stratigraphy, field methods and possible geophysics in a small undergraduate department. Prefer young Ph.D. Start Sept. 1960. Box 115.

THE PHYSICS DEPARTMENT of the University of Alberta invites applications from Students for graduate study in Geophysics. Research in progress includes studies of heat flow, paleomagnetism, gravity and glaciology in the Rocky Mountains, age-determination, natural electromagnetic fields, and electrical properties of the earth. Support is available in the forms of Teaching Fellowships (up to $3600 for 12 months), Teaching Assistantships (up to $3200 for 12 months or $2400 for seven months), and special Fellowships worth up to $2400 for 12 months. Applications should be sent, as soon as possible, to the Physics Department, University of Alberta, Edmonton, Alberta, Canada.

APPLICATIONS are invited for Chair of Geology, Salary: £S.2760 per annum. Cost of living allowance approximately £S.180 per annum at present. Outfit allowance £S.50. Family allowances: Wife £S.60 p.a., 1st child £S.90 p.a., 2nd and 3rd child £S.30 p.a., each. (£S.1 = £1.0.6 sterling). Passages for appointee and family on appointment, termination and annual leave. Superannuation Scheme. Appointment on contract for 5 years with possibility of renewal. Unfurnished accommodation provided at the rate of 7½% of salary. Applications (10 copies) detailing qualifications and experience and naming 3 referees to Registrar, University of Khartoum, % Inter-University Council for Higher Education Overseas, 29 Woburn Square, London, W. C. 1, from whom further particulars may be obtained.

## RESEARCH POSITION

Ph.D., or equivalent experience to coordinate a major program in carbonate rock research in a newly established geological research section. Should have several years' experience in paleoecology and/or carbonate petrography.

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Research and Development Department
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TEACHING POSITION—Rank (Asst. Prof.). Master's Degree in geol., geophysics, or engineering geology; broad background in physics. Two-man department, 12 hr. course load. Recent or June graduate acceptable. Complete academic and biographical data to Wiley S. Rogers, Head, Dept. of Geology, Birmingham-Southern College, B'ham, Ala.

UNIVERSITY OF WESTERN ONTARIO—London, Canada. Applications are invited for National Research Council of Canada and other Post-Doctoral Fellowships tenable in the Department of Geophysics, 1960-62. Facilities are available for research in the fields of rock magnestism, terrestrial heat flow, seismology, gamma-ray and neutron scattering, geophysical prospecting and operations research. Applications are also invited from prospective candidates for Graduate Fellowships, Scholarships and Teaching Assistantships tenable at U. W. O. in geophysics.

Address inquiries as to stipends, tax exemption, travel allowances, accommodation and application procedures to Robert J. Uffen, Department of Geophysics.

INSTRUCTOR in Geology to teach Physical and Historical Geology, Sedimentary Petrology, Glacial Geology, help with Independent Study and Field Methods. Write Dean, College of Wooster, Wooster, Ohio.

WANTED: PROJECT ENGINEER. Physicist or Geophysicist with seismic and sub-surface experience. Underwater acoustics experience very desirable. Important long-term projects in underwater communications. Applicant must have ability to provide technical direction and effective group management. Engineer and Junior Engineer staff positions also available to qualified personnel. Send resume to Mr. Virgil D. Hylton, Aerojet-General Corporation, P.O. Box 460, Frederick, Maryland.

INSTR. or ASST. PROF. for general education course in physical science. Start Sept. 1960; 9-mo. salary $5,000 or $6,000. Desire person under 45, with doctorate, or with master's and very high other qualifications. Contact General Studies Dept., Kansas St. Univ., Manhattan, Kans.

INSTRUCTOR with M.A. or M.S. wanted to teach introductory college courses in Geology and Geography in a strictly liberal arts curriculum. Please write, sending transcripts and references to: Chairman, Department of Natural Science, Bradford Junior College, Bradford, Massachusetts.

## POSITIONS WANTED

BOX 611. ASSISTANT PROFESSOR, Ph.D. major university wishes to teach in college or university in more desirable area. 3 yrs. teaching and 6 yrs. varied industrial experience. Primarily interested marine geology, paleontology, sedimentation, mineralogy. Active researcher, member prof. societies. Resume on request.

BOX 612. MUSICIAN and composer; full professor; major university; Yale graduate; 13 yrs. teaching experience; former violinist in internationally famous string quartet; Guggenheim Fellow; married; 2 children; wishes to teach in college or university in more desirable area; amateur geologist; would appreciate your bringing this ad to the attention of your Music Department. Resume on request.

BOX 640. PETROLOGIST, 38, Ph.D. '52.

BOX 646. GEOLOGIST, broad exploratory background in the Four Corners, Panhandle and West Texas. Eight years experience includes subsurface, administration and seismograph. Some field and well work. Desires more responsibility.

BOX 647. GEOLOGIST, Ph.D., 34, married. Desires permanent teaching position in small to moderate size school and town, preferably in south or west. Broad geological background in teaching and research, especially in sedimentary rocks, principles of stratigraphy, petroleum geology, and mineralogy. 2½ years experience with major oil company.

BOX 655. GEOLOGIST, Ph.D., 35, on sabbatical leave beginning February or June, 1960. Available for project work of any type, preferably foreign. Broad scientific background and diversified practical experience, especially within the mineral industry. Works well with people and enjoys all phases of the profession.

BOX 658. RETIRING DEPARTMENT CHAIRMAN with 30 years of successful teaching in eastern men's college is interested in 1 semester or 1 year appointments beginning September 1960 as visiting professor or lecturer. Especially interested in courses in regional geomorphology and geology of U.S. and history of geological science.

BOX 659. GEOLOGIST, B.S., M.S., 29, vet., single. One year experience in Venezuela and some teaching experience. Would like a teaching or research position in a college offering studies toward a Ph.D. Main interest, sedimentation and stratigraphy.

BOX 660. ASSISTANT PROFESSOR, Ph.D., desires change. Presently at small midwest university. 7 yrs. teaching experience. Also 5 yrs. various industrial consulting and state survey experience. Desire more active and progressive department. Location midwest or west. Principal fields: geomorphology, paleozoic stratigraphy, non-metallic economic. Publications, member of professional societies. Additional information upon request.

BOX 662. GEOLOGIST, Ph.D., 33, family, 7 years practical experience (U.S. and foreign) seeks career in teaching. Principal interests: stratigraphy and historical geology, not restricted to North America.

BOX 665. PALEONTOLOGIST, Ph.D., 32, five years teaching experience. Specialties geochemsitry and paleoecology but have taught courses in many other areas. Desires teaching position with opportunity for research starting Sept. 1960.

BOX 667. PALEOECOLOGIST, M.A., 33, married, 3 years paleoecology-stratigraphy experience with major oil company. Two years college teaching, California teaching credential, publications. Desires teaching or research position. Available January 1960. Resume on request.

BOX 668. PALEONTOLOGIST, M.S., in geology. Family. 7 years experience in California, 1 year in the Rocky Mountains with the major Oil Companies. Up. Cretaceous and Tertiary foraminifera. Russian, German fluently. Will consider any work.

DESIRE FOREIGN POSITION in or leading to Geophysical Interpretation. 26, single, B.S. in geology, 2 years domestic experience on the Gulf Coast and Rocky Mountains and 18 months in Turkey—all in seismic exploration. Excellent references. Resume on request. Available March 1. Contact G. H. Farrance, 174 Bogert Road, River Edge, N.J.

BOX 669. GEOLOGIST, B.S., 35, single. Eight years experience in petroleum exploration and production. Interest in all phases of earth science. Will consider any change and relocate anywhere.

BOX 670. GEOLOGIST, M.S., Ph.D. work completed, 31, married, veteran, 4 yrs. experience stratigraphic mineral deposits, sedimentology. Desires petroleum work domestic or foreign.

BOX 671. GEOLOGIST, Ph.D., 37, married, 5 years industrial experience, 2 years teaching experience, desires teaching and/or research position. Primary interests: sedimentation, sedimentary petrography, petroleum geology, stratigraphy. Secondary interests: structure, field geology, economic geology.

BOX 672. SURVEYORS (2), GEOLOGIST, B.S. and Ranger School graduate, both married. Familiar with all field and office work; transit, plane table, level, and staff compass, map computation and drafting. Will relocate anywhere. Resume on request.

BOX 673. GEOLOGIST, B.S., 25, family, 2 yrs. U.S. Army, surveying experience. Desires position in exploration or mineralogy and petrology. Prefers Western U.S.

BOX 674. GEOCHEMICAL Prospector, 36, B.S., Chem. Eng.; M.S., Geophys. and Geochem.; Ph.D., Geology in June. Publications. Experience: 3.5 years geochemical prospecting research; 3.5 years geologic mapping and geochemistry of uranium deposits. Desire position developing and applying geochemical prospecting methods. Available in June.

BOX 675. GEOLOGIST, 31, Ph.D., '60, excellent references, background; teaching experience, USGS, major oil company. Desires teaching position, interests in structural geology, sedimentation, mineralogy, economic geology, etc.

BOX 676. PETROLEUM GEOLOGIST-Stratigrapher, 32, M.S., family, 6 yrs. varied exp. U.S., Canada and Foreign with major oil and consulting. Desire position of responsibility in research or exploration. Executive ability, presently chief geologist. Consider any reasonable offer.

BOX 677. GEOLOGIST, Ph.D., 32. Excellent record at well known northeastern universities. Married, 2 children, USGS experience. Publications, best references. Enjoy teaching (5 years experience stratigraphy, paleont., etc.) but willing to consider oil or research openings. Resume on request.

BOX 678. ECONOMIC GEOLOGIST, M.S., 37, desires teaching or mineral industries position, U.S. or foreign. Five years lab and field experience in mineral deposits, ore microscopy, petrography, X-ray and chemical analysis, mapping, core logging; knowledge cement and evaporites; some teaching experience; publications. Graduate work toward Ph.D. Married; resume on request.

GEOLOGIST, 24, single, draft exempt, B.S., geology, University of Texas, June, 1957. Have just completed 2 years with U.S. Army, Sept. 1957 to Sept. 1959. Desires employment in petroleum exploration, preferably Southwest U.S., but is free and willing to travel anywhere. Although experience limited to summer work, Texas oil fields, it is my opinion that I have a high potential in exploration geology, and would consider experience gained above salary. Contact Jack S. Sanders, 524 W. Owing St., Denison, Texas, phone HO. 5-2381.

BOX 679. GEOLOGIST, B.A., '57, 25, married. Desires trainee position in any phase of geology or allied field. Some experience with major oil co. in sub-surface mapping. Experience will be chief remuneration. Foreign or domestic. Prefer west coast.

BOX 680. PETROLEUM GEOLOGIST, 40, family. Fifteen years experience in Venezuela and Colombia, specialized in subsurface and development geology, log analysis and formation evaluation. Six years supervision. Presently employed. Available on or before January 31, 1960. Prefer permanent position. Willing to travel.

## POSITIONS WANTED—*continued*

BOX 681. GEOLOGIST, M.S., 39, family, 9 years teaching experience in eastern and midwestern universities. Several summers experience with state geological survey and consultant for private corporations. Chief interests sedimentation, mineralogy and petrology. Will consider either a teaching position or an industrial offer. Available end of summer.

BOX 682. GROUND-WATER Geologist, B.S., 39, family. 5 yrs. Ground-Water Branch, U.S.G.S., 3 yrs. subsurface, major oil co. Desire ground water work in west or southwest.

BOX 683. STRATIGRAPHER-MICROPALEONTOLOGIST, Ph.D., 34, Five years experience in laboratory (paleozoic forams) and general exploration work with a major oil company. Wishes to settle. Interested in teaching or willing to learn and work in any field. Experience and academic qualifications on request.

SALESMAN, 25, Degree in Geology, two years Terrain Analyst-Army Engineers, presently in Marketing with major oil company in east, will relocate, resume on request. Write Box 8133, Philadelphia, Pa.

BOX 684. PETROLOGIST - SEDIMENTOLOGIST, Ph.D., 29, family. Desires permanent teaching position with possibility for research, or research laboratory-major oil co. Training in all phases of petrology and sedimentology, including litho-facies mapping techniques, environmental interpretations, subsurface geology, and statistical analyses. Two years varied experience with a major oil company. Teaching experience. Equivalent of two years field experience. Resume available on request.

BOX 685. PETROLOGIST, Ph.D., 36, family. Desire teaching and/or research position in department that offers good Ph.D. program; 10 years experience in teaching and reseach; numerous publications; now employed—available 90 days after notification.

BOX 686. STRATIGRAPHER-PALEONTOLOGIST, Ph.D., 33, desires teaching position or challenging position in petroleum industry. 4½ years varied petroleum and 3 years university teaching experience. Resume on request. Employed. Available June 1.

GEOLOGIST, 29, married, desires position in oil company, 3 years field experience as photogeologist, 1 year as subsurface geologist. Fluent English, French, Spanish. References. Write: A. Orlandoni; B.go Tommasini, 18; Parma, Italy.

BOX 687. MINING GEOLOGIST, Ph.D. level education, registered professional engineer. 11 years diversified experience in exploration and mining, geophysics and geochemistry, and property evaluation. Principal interest is application of modern geological techniques and concepts to ore search. Presently employed. Will relocate east or west.

BOX 688. GEOLOGIST, B.A., 31, married. 5 years experience. Desires position in mining, exploration, or engineering geology. Available on reasonable notice. Resume on request.

BOX 689. PETROLOGIST-GEOCHEMIST, 32, Ph.D. Five years experience in major oil company research laboratory in fields of x-ray and spectrographic analysis, clay mineralogy and geochemistry of sediments. Broad graduate background in geology. Teaching experience in elementary geology, physics, and chemistry at small college. Desires position at college or university, preferably in Rocky Mountain Region. Available in late August, 1960.

BOX 690. ASSISTANT PROFESSOR, Ph.D. Major University, 5 years field experience North and South America, 4 years university teaching, 33, family. Desire college or university teaching position permitting research. Now teach petroleum geology, subsurface geologic methods, elementary and advanced stratigraphy and invertebrate paleontology. Present research in stratigraphy, sedimentation, geomorphology, and paleoclimatology. Numerous publications. Available June 1960. Resume on request.

BOX 691. ASSISTANT PROFESSOR, Ph.D. state university desires position in medium size college or university allowing at least ½ load for research projects. 3½ years teaching and 2 years industrial experience. Primary interest in physical geology, quantitative geomorphology, sedimentation and mineralogy. Member of professional societies. Resume on request.

BOX 692. GEOLOGIST, Ph.D. expected 1960, 27, single. Desires teaching and research position in university in sedimentary petrology, stratigraphy and sedimentation commencing with the fall term in 1960. Special interests include sandstone petrology, sedimentary structures and paleocurrents. Geological experience includes 6 summers mapping and research in Canada and 1 year in midcontinent. Teaching experience of 3 years at elementary and senior course level.

## CONSULTANTS

J. W. SCHROEDER, PETROLEUM GEOLOGIST, P. O. Box 275, Cornavin, Geneva, Switzerland.

GEOLOGIST, 32, USA, will take short term assignments oil—mineral, surface, subsurface investigations anywhere in world for expenses and interest. Consider partnership arrangements. References. Box 10.

G. H. NEWMAN, CONSULTING GEOLOGIST P.O. Box 2418, Manila, Philippines.

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COPY OF 'Bibliography and Index of Geology Exclusive of North America' vol. 11, 1945-1946. Quote price to: Department of Mineral Economics, Pennsylvania State University, University Park, Pennsylvania.

WANTED: HOPPER CRYSTALS. Please write, Farquhar, Rte. 3, Amherst, Mass.

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